Wind Turbine Guidelines Advisory Committee: Cover Memo to the Reader of Draft v6.1 of the Synthesis Workgroup Recommendations.

TO: Readers of USFWS Wind Turbine Guidelines Advisory Committee Public Packet

FR: USFWS Wind Turbine Guidelines Advisory Committee Synthesis Workgroup, or Drafting Subcommittee

RE: Background and Explanation of Draft v.6.1

DT: December 16, 2009

The attached *Draft v.6.1* of the Synthesis Workgroup Recommendations to the Secretary of the Interior (Secretary) is a public draft for the Committee to review and discuss when they next reconvene in-person, but this is not yet a consensus draft. As with previous drafts, this draft is a product of the Synthesis Workgroup. The Synthesis Workgroup is continuing to work on certain sections of this draft, and these are listed below. Therefore, another version including these additional edits may be distributed prior to the next in-person FAC meeting.

In the attached Draft v.6.1, the following section was inserted and is highlighted in gray:

• Phase-in for Using Committee's recommended Guidelines (page 68, line 2787 – page 69, line 2825)

The following sections are still under revision, and are highlighted in gray and noted with a comment in the margin:

- The **track changes** that were in Draft v.6 <u>remain</u> in Draft v6.1, indicating edits for the Committee to review that the Synthesis Workgroup has not had time to discuss.
- The habitat fragmentation language is still under review. Certain sections of this revision are highlighted in gray because the Synthesis Workgroup did not fully agree to the language (p.16, lines 838-858 and p.29, line 1346 p. 30, line 1413)
- **Tier 4 Post-Construction Duration of Fatality Studies:** revisions to this section are still being drafted (for p. 45, line 1965).
- **Tier 4 Question 7:** the Synthesis Workgroup did not reach agreement on this language, and it requires further FAC discussion (p.52, lines 2223-2232).
- Examples in Tier 5: additional examples are under review to include in "Tier 5 Studies and Research" under the headings for "Displacement Studies" and "Assessment of Population Level Impacts" (p.58 lines 2458-2478).

Dear Secretary Salazar: Attached please find the Wind Turbine Guidelines Advisory Committee (Committee) recommendations. In 2007, the Committee was established under the Federal Advisory Committee Act, to provide advice and recommendations on developing effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy facilities. Our Committee is comprised of 22 members representing governments, wildlife conservation organizations and wind industry organizations. We are pleased to provide these recommendations. We have divided our report into two sections, policy recommendations and recommended voluntary guidelines for wind siting and operations to avoid or minimize potential impacts to wildlife and habitat from wind energy development. We appreciate your consideration of these recommendations. The Committee has worked diligently to understand each other's interests and believes this product is highly professional and scientifically credible. The members remain committed to further assist in implementing guidelines that will achieve minimal impacts to wildlife and habitats, while providing the flexibility to develop the nation's wind energy resources. Please contact Dave Stout, Committee Chairperson, at 703-358-2555, if you require any additional information about the Committee's recommendations. Taber Allison, Massachusetts Audubon Society Ed Arnett, Bat Conservation International Michael Azeka, AES Wind Generation Kathy Boydston, Texas Parks and Wildlife Department René Braud, Horizon Wind Energy Scott Darling, Vermont Fish & Wildlife Department

Aimee Delach, Defenders of Wildlife

Mike Daulton, National Audubon Society

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Cover Letter

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Preamble and Policy Recommendations

Draft (v.6) - Pre-decisional

October 26, 2009

Wind Turbine Guidelines Advisory Committee Recommendations

U.S. Fish and Wildlife Service

Wind Turbine Guidelines Advisory Committee

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Preamble to the Committee Recommendations

Δ	Establishment	of Wind Turbine	Guidelines Advisor	v Committee

- In response to interest in the development of wind energy in the United States, the U.S. Fish 126
- and Wildlife Service (USFWS) in July 2003 released for public comment a set of voluntary, 127
- interim guidelines for developing wind energy projects. After USFWS reviewed the public 128
- comments, the Secretary of the Interior (Secretary) established a Federal Advisory 129
- Committee to provide recommendations to avoid or minimize impacts to wildlife and their 130
- habitats related to land-based wind energy facilities. In March of 2007, USFWS announced 131
- the establishment of the Wind Turbine Guidelines Advisory Committee (the Committee) in 132 133
 - the Federal Register.

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Pursuant to the requirements of the Federal Advisory Committee Act (FACA), the Committee Charter was signed by the Secretary on October 26, 2007, effective for two years. The Charter states the Committee's scope and objective:

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"The Committee will provide advice and recommendations to the Secretary of the Interior (Secretary) on developing effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy facilities."

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The attached Recommended Guidelines (Guidelines) are the result of two years of deliberation by the Committee.

Committee Members

- 147 Committee Members were carefully selected by the Secretary from a large pool of candidates to represent a balance of stakeholder groups with the necessary policy, 148
- 149 technical, and scientific expertise to address minimization of wildlife impacts associated with
- the development of the Nation's wind energy potential: 150

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- Taber Allison, Massachusetts Audubon Society 152
- 153 Ed Arnett, Bat Conservation International
- Michael Azeka, AES Wind Generation 154
- Kathy Boydston, Texas Parks and Wildlife Department 155
- René Braud, Horizon Wind Energy 156
- Scott Darling, Vermont Fish & Wildlife Department 157
- Mike Daulton, National Audubon Society 158
- Aimee Delach, Defenders of Wildlife 159
- 160 Karen Douglas, California Energy Commission
- 161 Greg Hueckel, Washington Department of Fish & Wildlife

Wind Turbine Guidelines Advisory Committee Recommendations

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163	Steve Lindenberg, U.S. Department of Energy
164	Andrew Linehan, Iberdrola Renewables
165	Rob Manes, The Nature Conservancy
166	Winifred Perkins, Next Era Energy
167	Steve Quarles, Crowell & Moring, LLP
168	Rich Rayhill, Ridgeline Energy, LLC
169	Robert Robel, Kansas State University
170	Keith Sexson, Association of Fish and Wildlife Agencies
171	Mark Sinclair, Clean Energy Group
172	Dave Stout, U.S. Fish & Wildlife Service
173	Patrick Traylor, Hogan & Hartson, LLP

B. Background on Context and Need for the Recommended Guidelines

Wind development in the United States increased by 46% in 2007, and at the end of 2007 the U.S. had the second highest cumulative wind capacity globally. This rate of development is expected to continue, and perhaps to accelerate, as United States energy policy emphasizes independence from foreign oil and reduction of carbon emissions. USFWS and the Committee Members recognize that wind-generated electrical energy is renewable, and is considered to be a generally environmentally-friendly technology.

Wind energy produces electricity without air pollution, greenhouse gas emissions, water consumption, mining, drilling, refining, waste storage and other problems associated with many traditional forms of energy generation. Wind energy has recently received increased attention because it is a domestic source of energy, and because carbon dioxide emissions from fossil fuel combustion is the leading cause of anthropogenic climate change, which is likely to have serious negative impacts on ecosystems and wildlife. The U.S. Department of Energy (DOE) estimates that a single 1.5 MW wind turbine displaces 2700 metric tons of CO₂ per year compared with the current U.S. average utility fuel mix. In some locations, wind prevents urban and suburban encroachment into traditional greenbelts. Given these advantages, wind is expected to play an increasingly important role in meeting the nation's energy goals in the coming years.

Nevertheless, as the U.S. moves to expand wind energy production, it also must maintain and protect the nation's wildlife and habitats, which wind energy production can negatively affect. As with all responsible energy development, wind energy projects should adhere to high standards for environmental protection. With proper diligence to siting, operations, and management of wind energy facilities it is possible for wind energy projects to mitigate

¹(20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply. (2008).248 pp; NREL Report No. TP-500-41869; DOE/GO-102008-2567).

² Intergovernmental Panel on Climate Change 2007

³ 20% Wind Energy by 2030 2008).

for adverse impacts to wildlife and their habitats. Mitigation is defined in this document as avoiding or minimizing adverse impacts, and when appropriate, compensating for unavoidable significant adverse impacts, as determined through the tiered approach described in the recommended Guidelines, attached.

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C. Committee Premises and Guiding Principles

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Committee Premises

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 The Committee acknowledges the USFWS definition of wildlife (see glossary). The Committee recognizes that different species and species groups have different levels of protection under tribes, federal and state wildlife statutes (see Appendix B for Legal White Paper).

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It is the Committee's intention to identify, evaluate and recommend approaches to assessing risk and impacts to wildlife associated with wind energy development that are useful regardless of the regulatory status of any particular species, and that are particularly focused on those species most likely to be affected by wind energy development.

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2. The Committee recognizes that, among different wind energy projects, there will be varying degrees of potential impact to wildlife as well as varying degrees of certainty associated with the assessments of that potential impact. Thus varying levels of effort will be appropriate in assessing the risk of potential projects and determining how or whether the projects are developed.

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3. The Committee recognizes that it is possible and essential to mitigate negative impacts on wildlife populations and habitats while balancing expected impacts with the costs of undertaking necessary studies and monitoring.

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Committee Guiding Principles

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The Guidelines should:

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 Provide a consistent methodology for conducting pre-construction risk assessments and post-construction impact assessments to guide siting decisions by developers and agencies.

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2. Encourage communication and coordination between the developer and relevant state and federal agencies during all phases of wind energy project development.

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3. Provide mechanisms to encourage the adoption and use of the Guidelines by all federal agencies, as well as the wind energy industry, while recognizing the primary role of the lead agency in coordinating specific project assessments.

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- 4. Complement state and tribal efforts to address wind/wildlife interactions and provide a voluntary means for these entities to coordinate and standardize review of wind projects with the USFWS.
- 5. Provide a clear and consistent approach that increases predictability and reduces the risk of liability exposure under federal wildlife laws.
- 6. Provide sufficient flexibility to accommodate the diverse geographic and habitat features of different wind development sites.
- Present mechanisms for determining compensatory mitigation, when appropriate, in the event of unforeseen impacts to wildlife during construction or operation of a wind energy project.
- 8. Define scientifically rigorous and cost-effective study designs that improve the ability to predict direct and indirect wildlife impacts locally and regionally.
- 9. Include a formal mechanism for revision in order to incorporate experience, technological improvements, and scientific advances that reduce uncertainty in the interactions between wind energy and wildlife.

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Committee Policy Recommendations

A. Adoption and Use of the Guidelines

Adopt and consistently implement the voluntary Guidelines recommended in this document. The Committee gave considerable attention to the production of a suggested protocol for wildlife assessment and siting decisions at wind energy projects. This protocol, described in detail in Chapter 3 of this document, uses a tiered approach to evaluate, predict, and minimize the risk of potential wind energy projects to wildlife and habitat, and to assess and, as appropriate, provide compensatory mitigation for post-construction impacts. The Committee believes that the final product reflects a comprehensive and user-friendly risk assessment and decision-making tool that supports Department of the Interior (DOI) priorities with respect to renewable energy development, federal and state trust responsibilities, developer cost and confidentiality concerns, and the needs of federal or state listed wildlife and habitats, without creating new regulations. The Committee recommends that the Secretary direct USFWS to promptly adopt the recommended

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In adopting and implementing the Guidelines, use the premises and principles adopted by the Committee, as set forth above.

B. Tools and Support for Implementation

voluntary Guidelines developed by the Committee.

Develop landscape tools and provide analysis to assist in implementation of the Guidelines.

The Committee recommends that the Secretary instruct USFWS, in consultation with the

285 U.S. Geological Survey (USGS) and state agencies, to assemble and maintain a

286 comprehensive national scale landscape database based on scientifically credible sources.

287 This database will assist in identifying and assessing development risks to ecosystems, large-

288 scale habitats, and migratory and resident species that rely on large-landscape or specialized

289 habitats. In developing this database, the USFWS should consult and assess existing and on-

290 going landscape analysis and mapping efforts focused on renewable energy, including, but

291 not limited to: the California Renewable Energy Transmission Initiative (RETI), Western

292 Governors' Association Wildlife Habitat Council, The Nature Conservancy, National Audubon

Society, and American Wind and Wildlife Institute activities. Such a database should have

broad applicability to help guide decisions regarding other types of development, including

other energy sources. However, the Committee stresses that the lack of landscape level

tools should not in any way delay the use and application of the recommended Guidelines.

Provide and/or support adequate, meaningful incentives for industry's voluntary adoption

of the Guidelines. The Committee has explored a suite of incentives to encourage universal adoption of the recommended voluntary guidelines. The Committee recommends that DOI

implement incentives within DOI's purview simultaneously with adoption and

302 implementation of the Guidelines. The Committee also recommends that DOI engage

constructively to support potential incentives that are outside the purview of DOI (for instance those that would require statutory changes) and encourage their timely adoption and implementation.

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Advance the use, cooperation, and effective implementation of the Guidelines. Coordinate within DOI and with other federal agencies, tribes, states, wind developers and other stakeholders to maximize the use and effectiveness of the Guidelines. In order to do this, the Committee recommends the Secretary consider the following:

311 312 313 Encourage collaboration and coordination with other federal and state agencies and tribes to ensure timely and consistent review of wind energy projects and resolve conflicts among and within agencies.

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Develop best management practices based on the Guidelines.

315 316 Promote use of the Guidelines by federal and state agencies, as well as by the private sector.

317 318 • Provide training to USFWS and other federal or tribal agency field personnel on effective use of the Guidelines.

319 320 Advance the involvement and cooperation of non-governmental organizations with an interest in improving siting and compensatory mitigation for wind energy projects.

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Assure that the USFWS has an adequate budget and staff resources to implement the Guidelines as necessary, including training of Regional and Field staff and other interested stakeholders.

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When making policy decisions, address both the threat to birds and other wildlife from climate change, and the effects of other stressors. When conducting its review of wind energy development pursuant to the Guidelines, the Secretary is encouraged to make management, policy, project-specific assessment, siting, and mitigation decisions with appropriate consideration of wind energy's air pollution, greenhouse gas, water consumption, and other benefits. According to the USFWS Climate Change Strategic Plan (Strategic Plan), climate change is the greatest challenge the Service has ever faced in conserving fish, wildlife and their habitats. The Strategic Plan outlines a joint commitment to mitigation⁴ (reducing the sources or enhancing the sinks of carbon dioxide) and adaptation⁴ (management to reduce the impacts of climate change on fish, wildlife and habitats). The Committee urges the Secretary to hold both of these commitments in mind when making management decisions related to wind development: recognizing both the important role that wind energy, as a carbon-free energy source, will play in climate change mitigation⁴, while also delivering wind energy projects on the landscape in a manner that supports wildlife adaptation⁴ to climate change, namely by minimizing wind energy development's potential to itself be a non-climate stressor.

⁴ As defined by the Intergovernmental Panel on Climate Change (IPCC).

Wind Turbine Guidelines Advisory Committee Recommendations

C. Future Application

Work with other federal and tribal agencies, stakeholders, and states to develop a national research plan that identifies and implements research priorities to reduce impacts to wildlife resources while allowing wind energy development. Research should be conducted collaboratively, wherever possible, and should include appropriate stakeholders and peer review.

Revise the Guidelines. Review and revise the Guidelines, as justified, at least once every five years to incorporate new knowledge on wildlife interactions with wind energy and the rapidly advancing technology of commercialized wind energy production. The Secretary should use the Committee's premises and principles to assist in revisions of the Guidelines.

DOI should improve its capability to assess cumulative impacts by working with the USFWS Regions to:

• Review the range of development-related significant adverse impacts.

 Review species of concern and/or their habitats within the landscape at the most risk
of significant impacts from wind development, in conjunction with other reasonably
foreseeable significant adverse impacts.

Develop data that can be used to conduct regional or landscape level analysis.

The product of regional analyses of cumulative impacts should be available to inform Tier 1 preliminary site assessment or Tier 2 site characterization and may be useful for designing Tier 3 wildlife surveys. However, the Committee stresses that the lack of tools for cumulative impact analysis should not in any way delay the use and application of the recommended Guidelines.⁵

⁵ The Committee also recommends that in developing the scope of this cumulative effects analysis, the USFWS review the conclusions of the white paper on cumulative effects analysis developed by the USFWS, Oregon Department of Fish and Wildlife, and other stakeholders during the development of the Oregon Columbia Ecoregion Wind Energy Siting and Permitting Guidelines (September 29, 2008). The white paper reviewed multistate cumulative effects analyses prepared by WEST, Inc. in the Pacific Northwest and made recommendations on how such analyses could be more effective. Recommendations included:

[•] Collaborative funding and management of regional cumulative effects analysis

[•] Focus on a limited number of key regional indicator species and habitats most likely to be affected by wind energy

[•] Studies to better understand the population dynamics of the key indicator species and to develop "impact levels of concern"

Development of an action plan for impacts to key species and habitats that are above "threshold of concern" levels



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U.S. Fish and Wildlife Service Wind Turbine Guidelines Advisory Committee

Draft Recommended Guidelines

Recommendations on developing effective measures to mitigate impacts to wildlife and their habitats related to land-based wind energy facilities

Submitted to the Secretary of Interior (Date)

By the Wind Turbine Guidelines Advisory Committee

Acknowledgments

The Chairman would like to note the following individuals who offered their assistance to the Committee. With an impressively broad range in expertise and interests, their hard work and dedication contributed to and ensured the success of this process and the quality of the final report:



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U.S. Fish and Wildlife Service Wind Turbine Guidelines Advisory Committee Draft Recommended Guidelines

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Executive Summary

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Chapter One: Introduction

A. Background

In response to the United States' growing demand for production of electricity by wind energy and in recognition of the U.S. Fish and Wildlife Service (USFWS) mission "Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people," the Secretary of the Interior (Secretary) authorized USFWS to charter the Wind Turbine Guidelines Advisory Committee (Committee) to recommend effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy facilities.

Herein are the Committee's Recommended Guidelines (Guidelines). They are based on two years of deliberations and judgments regarding the siting and operation of large wind energy developments while minimizing adverse impacts to wildlife and their habitat. The Committee is composed of a broad array of representatives, among the most informed in the country, selected for their outstanding experience on these issues. These Guidelines are the Committee's best attempt to present the most effective, feasible, practicable, and appropriate approaches that are available to the Department of the Interior (DOI), tribes, states, local jurisdictions, and the wind industry to address USFWS responsibilities to protect wildlife resources while encouraging responsible siting and operation of wind energy projects.

B. Premises and Guiding Principles

In its development of these Guidelines, the Committee accepted by consensus⁶ the following premises and principles and recommends these be incorporated into the final guidance published by the USFWS.

Premises

The Committee acknowledges the USFWS definition of wildlife (see Glossary).
 The Committee recognizes that different species and species groups have different levels of protection under tribes, federal and state wildlife statutes (see Appendix B for Legal White Paper).

It is the Committee's intention to identify, evaluate and recommend approaches to assessing risk and impacts to wildlife associated with wind energy development that are useful regardless of the regulatory status of any particular species, and that are particularly focused on those species most likely to be affected by wind energy development.

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⁶ March 26, 2009

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- 2. The Committee recognizes that, among different wind energy projects, there will be varying degrees of potential impact to wildlife as well as varying degrees of certainty associated with the assessments of that potential impact. Thus varying levels of effort will be appropriate in assessing the risk of potential projects and determining how or whether the projects are developed.
- The Committee recognizes that it is possible and essential to mitigate negative impacts on wildlife populations and habitats while balancing expected impacts with the costs of undertaking necessary studies and monitoring.

Principles

The Guidelines should:

- 1. Provide a consistent methodology for conducting pre-construction risk assessments and post-construction impact assessments to guide siting decisions by developers and agencies.
- 2. Encourage communication and coordination between the developer and relevant state and federal agencies during all phases of wind energy project development.
- 3. Provide mechanisms to encourage the adoption and use of the Guidelines by all federal agencies, as well as the wind energy industry, while recognizing the primary role of the lead agency in coordinating specific project assessments.
- 4. Complement state and tribal efforts to address wind/wildlife interactions and provide a voluntary means for these entities to coordinate and standardize review of wind projects with the USFWS.
- 5. Provide a clear and consistent approach that increases predictability and reduces the risk of liability exposure under federal wildlife laws.
- 6. Provide sufficient flexibility to accommodate the diverse geographic and habitat features of different wind development sites.
- Present mechanisms for determining compensatory mitigation, when appropriate, in the event of unforeseen impacts to wildlife during construction or operation of a wind energy project.
- 8. Define scientifically rigorous and cost-effective study designs that improve the ability to predict direct and indirect wildlife impacts locally and regionally.

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C. Purpose of the Guidelines

The primary purpose of these Guidelines is to describe the information typically needed to identify, assess, and monitor the potentially adverse impacts of wind energy projects on wildlife and their habitat, especially migratory birds and bats, in order to:

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- Guide the wind energy industry to make the best possible choices on the location, design and operation of wind energy installations to avoid or minimize the risks to wildlife and their habitat.
- Ensure that the responsible regulatory agency or advisory agency for any wind
 energy installation is aware of and considers the appropriate factors that present
 risks to wildlife and their habitat and the full range of options to avoid, minimize and,
 as appropriate, provide compensation for unavoidable significant adverse impacts.
- Specify the types and amount of baseline information required for adequate review
 of a wind energy project; and describe the likely extent of follow-up that would be
 necessary after construction.

Additional purposes of the Guidelines are to:

- Promote responsible development of wind energy facilities across the country.
- Enable states, tribes, USFWS, developers and stakeholders to share information and data regarding avian and bat studies, avoidance, minimization, and as appropriate, compensatory mitigation, siting practices, and monitoring of habitat/species impacts, to increase understanding of risks and the effectiveness of siting and operating decision-making.
- Develop effective, consistent and cost-effective methods and protocols to guide project-specific studies, to improve assessment of risk and impacts by producing comparable data.
- Allow for comparison among field studies from around the country.

D. Benefits of Using the Guidelines

As the U.S. moves to achieve its renewable energy commitments, it must also maintain and protect its wildlife resources. The Committee's recommended Guidelines will facilitate wind energy development while protecting wildlife and their habitat. The Guidelines provide best management practices for wind energy-wildlife interactions and, although voluntary, will result in greater regulatory certainty for the wind developer, resulting in the following four types of benefits.

1. Reduced Ecological Impacts

The Guidelines offer a science-based reference for use by industry, federal, state, tribal and local agencies, and other stakeholders in the siting and permitting of wind energy projects.
The Guidelines describe the kind of information needed to adequately identify, assess, mitigate, and monitor the wind-wildlife impacts when developing new wind energy projects and repowering existing facilities. The Guidelines will promote scientifically sound, cost-effective study designs; produce comparable data among studies throughout the country; allow for analyses of trends and patterns of impacts at multiple sites; and ultimately improve

the ability to estimate and resolve impacts to wildlife and habitats locally and regionally.

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2. Increased Compliance and Reduced Regulatory Risk

The Guidelines are a tool for facilitating compliance with relevant laws and regulations by 218 219 recommending methods for conducting site-specific, scientifically sound biological evaluations. Following the guidelines is consistent with the National Environmental 220 Protection Act (NEPA), namely, to provide full and fair discussion of adverse impacts of wind 221 development upon wildlife arising from potential federal actions. The Guidelines are also 222 223 consistent with the intent of NEPA to promote efforts that will prevent or eliminate damage to the environment. The Guidelines facilitate achieving the NEPA objective of ensuring that 224 environmental resources are given appropriate consideration in planning and decision-225 making processes. Using the methods described in the Guidelines will provide information 226 for impact assessment and mitigation. Mitigation is defined in this document as avoiding or 227 228 minimizing adverse impacts, and when appropriate, compensating for unavoidable significant adverse impacts, as determined through the tiered approach recommended in 229 230 the Guidelines. When used hereafter in this document, the term "mitigation" includes, collectively, the concepts of avoidance, minimization, and, as appropriate, compensatory 231 232 mitigation (see Chapter Four). Using the Guidelines also demonstrates a good faith effort to develop and operate wind energy projects consistent with the intent of local, state, and 233

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3. Improved Predictability of Wildlife and Habitat Impact

The goal of the Guidelines is to provide a consistent, predictable approach to assessing impacts to wildlife and habitats from wind energy projects, while providing flexibility to accommodate the unique circumstances of each project. As comparable information using consistent and common methods and protocols becomes available from projects around the nation, meta-analysis will continue to provide information that allows better predictive modeling. The growing body of information will assist in providing valuable information on "use" of wind energy sites by and potential impacts to wildlife. Over time the growing knowledge base should decrease the need for some monitoring studies.

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4. Cost Savings

federal laws.

The Guidelines will promote scientifically sound, cost-effective study designs that are proportionate to the risk to wildlife and their habitats; produce comparable data among

studies within the nation; allow for analyses of trends and patterns of impacts at multiple 249 sites; and ultimately improve the ability to predict and resolve impacts locally, regionally and 250 nationally. This will reduce the need for some studies, thereby reducing project costs. 251 252 Initiating pre-construction surveys early will help to avoid unnecessary and costly delays during permitting. The Guidelines advise that the costs and the resulting benefits be 253 considered when developing the monitoring efforts needed for each project site. Some 254 monitoring methods and/or technologies are expensive and should be recommended only 255 when necessary. 256

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Chapter Two: 259

Summary of the Guidelines and General Considerations

Intended Use of the Guidelines A.

262 These Guidelines are intended to be voluntary. Although voluntary, the Guidelines described 263

in this report are designed to be used by all prospective developers of wind energy projects

and by USFWS field staff reviewing such projects. The Guidelines also are intended to

suggest a useful approach for local, state and tribal officials, and other interested 265

266 stakeholders.

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The Committee wrote the Guidelines to be as specific as possible with regard to the

269 expectations, recommendations, and appropriate assessments for developing a wind

270 energy project. They must, however, apply to a large diversity of projects in many different

habitats. The Guidelines are intended to provide flexibility in their application, in 271

272 consideration of project-specific factors, and not be rigidly applied in every situation. The

Guidelines are designed to address current commercial technology. 273

Project Scale and Location

The tiered approach is designed to lead to the appropriate amount of evaluation in 275

276 proportion to the anticipated level of risk that the development may pose to wildlife and

their habitats. Study plans and the duration and intensity of study efforts should be tailored 277

278 specifically to the unique characteristics of each site and the corresponding potential for

279 significant adverse impacts on wildlife and their habitats as determined through the tiered

280 approach. In particular, the risk of adverse impacts to wildlife and their habitats tends to be

281 a function of site location, not necessarily the size of the project. A small project may pose

282 greater risk to wildlife than a larger site in a less sensitive location, and would therefore

283 require more pre- and post-construction studies than the larger site. This is why the tiered

approach begins with an examination of the potential location of the project, not the size of 284

285 the project. In all cases, study plans and selection of appropriate study methods and

techniques should be tailored to the relative scale, location and potential for significant

287 adverse impacts of the proposed site.

Project Interconnection Lines

289 The Guidelines are designed to address all elements of a wind energy facility, including the

290 turbine string or array, access roads, ancillary buildings, and the above- and below-ground

291 electrical lines which connect a wind energy project to the transmission system. It is

recommended that the project evaluation include consideration of the wildlife- and habitat-292

related impacts of these lines, and that the developer include measures to reduce impacts of 293

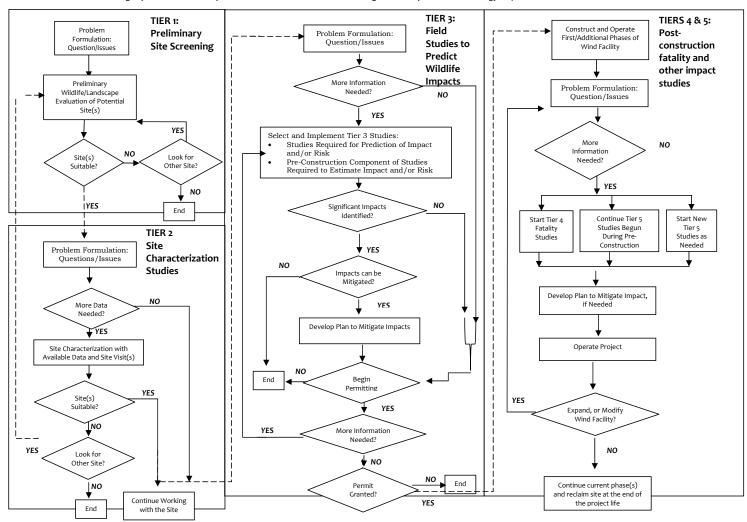
- 294 these electrical lines, such as those outlined in the Avian Power Line Interaction Committee
- 295 (APLIC) Suggested Practices (APLIC (Avian Power Line Interaction Committee). 2006.
- 296 Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006. Edison
- 297 Electric Institute. Washington D.C.). The Guidelines are not designed to address transmission
- beyond the point of interconnection to the transmission system. The national grid and
- 299 proposed smart grid system are beyond the scope of these Guidelines. This
- 300 recommendation does not supersede existing policies.

301 B. Introduction to the Decision Framework Using a Tiered Approach

- 302 The Committee recommends using a tiered approach, an iterative process for evaluating the
- 303 risks and minimizing the impacts to wildlife of a wind energy project. The tiered approach
- provides a decision framework for collecting information in increasing detail to evaluate risk
- and make siting and operational decisions. It provides the opportunity for evaluation and
- decision-making at each tier, enabling a developer to abandon or proceed with project
- 307 development, or to collect additional information if required. This approach does not
- 308 require that every tier, or every element within each tier, be implemented for every project.
- 309 Instead, it allows efficient use of developer and wildlife agency resources with increasing
- 310 levels of effort until sufficient information and the desired precision is acquired for the risk
- 311 assessment.

312 Application of the tiered approach and possible outcomes

- 313 The flow chart below ("General Framework for Minimizing Impacts of Wind Development on
- 314 Wildlife in the Context of the Siting and Development of Wind Energy") illustrates the tiered
- approach, which consists of up to five iterative stages, or tiers:
- Tier 1 Preliminary evaluation or screening of potential sites
- Tier 2 Site characterization
- Tier 3 Field studies to document site wildlife conditions and predict project impacts
- Tier 4 Post-construction fatality studies
- Tier 5 Other Post-construction Studies



Note: Mitigation is defined in this document as avoiding or minimizing adverse impacts, and when appropriate, compensating for unavoidable significant adverse impacts, as determined through the tiered approach.

At each tier, potential issues associated with developing or operating a wind energy project are identified and questions formulated to guide the decision process. Chapter 3 outlines the questions to be posed at each tier, and describes recommended methods and metrics for gathering the data needed to answer those questions.

If sufficient data are available at a particular tier, the following outcomes are possible based on analysis of the information gathered:

- 1. The project is abandoned because the risk is considered unacceptable
 - 2. The project proceeds in the development process without additional data collection, or
 - 3. An action or combination of actions, such as project modification, mitigation, or specific post-construction monitoring, is indicated.

If data are deemed insufficient at a tier, more intensive study is conducted in the subsequent tier until sufficient data are available to make a decision to abandon the project, modify the project, or proceed and expand the project.

Application of the tiered approach and risk assessment

Risk is defined as the likelihood that adverse impacts will occur to individuals or populations of species of concern as a result of wind energy development and operation. In this context, collision risk can be defined for individuals of a species or groups of species (such as raptors) as the estimated number of collision fatalities (impact), divided by the number of individuals in the zone of risk (exposure). Estimates of fatality risk can be used in a relative sense, allowing comparisons among wind energy projects, alternative development designs, and in the evaluation of potential risk to populations. Because there are relatively few methods available for direct estimation of risk, a weight-of-evidence approach is often used (Anderson et al. 1999). Until such time that reliable risk predictive models are developed, estimates of risk would typically be qualitative, but would be based upon quantitative site information.

Risk can also be defined in the context of populations, but the calculation is more complicated as it could involve estimating the reduction in population viability as indicated by demographic metrics such as growth rate, size of the population, or survivorship, either for local populations, metapopulations, or entire species. For most populations, risk cannot easily be reduced to a strict metric, especially in the absence of population viability models for most species. Consequently, estimating the quantitative risk to populations is usually beyond the scope of wind energy project studies due to the difficulties in evaluating these metrics, and therefore risk assessment will be qualitative. Risk to habitat is a component of the evaluation of population risk. In this context, the estimated loss of habitat is evaluated in terms of the potential for population level effects (i.e., reduced survival or reproduction).

The assessment of risk should synthesize sufficient data collected at a project to estimate exposure and predict impact for individuals and their habitat for the species of concern, with what is known about the population status of these species, and in communication with the relevant wildlife agency and industry wildlife experts. Predicted risk of these impacts could provide useful information for determining appropriate mitigation measures if determined to be necessary.

In practice in the tiered approach, risk assessments conducted in Tiers 1 and 2 require less information to reach a risk-based decision than those conducted at higher tiers.

637 Applicability of Adaptive Management

Adaptive management (AM) can be categorized into two types: "passive" and "active" (Walters and Holling 1990, Murray and Marmorek 2003). In passive AM, alternatives are assessed and the management action deemed best is designed and implemented. Monitoring and evaluation then lead to adjustments as necessary. In active AM, managers explicitly recognize that they do not know which management approaches are best, so they select several alternative management approaches to design and implement. Active AM, if necessary, should be explored and applied only when substantial uncertainty exists regarding the approaches to avoiding or minimizing adverse impacts. With the possible exception of evaluating project-specific mitigation measures, these Guidelines do not recommend that active AM be implemented at wind energy projects. Active AM may be appropriate if there is a specific research objective that is probably applicable to multiple wind energy projects; however, these Guidelines recognize that accomplishing such objectives is outside this decision framework, and would involve multiple stakeholders and funding sources.

Adaptive management, whether active or passive, is not typically applied to wind energy projects because in the majority of instances the impacts and the level of uncertainty do not warrant its use. Nevertheless, the tiered approach is designed to accommodate AM if warranted. In the pre-construction environment, analysis and interpretation of information gathered at a particular tier influences the decision to proceed further with the project or the project assessment. If the wind energy project is constructed, information gathered in the pre-construction assessment guides possible project modifications, mitigation or the need for and design of post-construction studies. Analysis of the results of post construction studies can test design modifications and operational activities to determine their effectiveness in avoiding or minimizing impacts. When there is considerable uncertainty over the appropriate mitigation for a project, active AM is the preferred approach to testing the effectiveness of alternative approaches.

⁷ In active adaptive management, monitoring and evaluation of each alternative helps in deciding which alternative is more effective in meeting objectives, and adjustments to the next round of management decisions can be based on those lessons.

For AM to work, there must be agreement to adjust management and/or mitigation
 measures if monitoring indicates that goals are not being met. The agreement should
 include a timeline for periodic reviews and adjustments as well as a mechanism to consider
 and implement additional mitigation measures as necessary after the project is developed.

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Passive and active AM as described above are similar to the process described in the DOI

- 672 Adaptive Management Technical Guide (Williams et al 2007). As described in the Technical
- 673 Guide, application of AM includes five key elements: stakeholder involvement, management
- 674 objectives, management alternatives, predictions of the effects of potential management
- 675 actions, and monitoring protocols and plans. These elements are folded into the structured
- 676 process of decision making, monitoring, and assessment. Passive AM, and its use in the
- 677 tiered approach, is consistent with the technique outlined in the Technical Guide.

678 C. Other Elements of the Guidelines

Use of Mitigation Policies and Principles

- These Guidelines contain valid, economic, and technically feasible and effective methods and
- metrics intended to evaluate risk and estimate impacts to wildlife, inform permitting
- decisions, and satisfy environmental assessment processes. The objective is to avoid or
- 683 minimize adverse impacts and when appropriate, to provide compensatory mitigation for
- 684 unavoidable significant adverse impacts, as identified in the tiered approach recommended
- 685 in the Guidelines. When used alone in this document, the term "mitigation" includes
- avoiding or minimizing adverse impacts, and compensating for unavoidable significant
- 687 adverse impacts. Several tools are available to determine appropriate mitigation, including
- the USFWS Mitigation Policy (USFWS Mitigation Policy, 46 FR 7656 (1981)). The USFWS
- policy provides a common basis for determining how and when to use different mitigation
- 690 strategies, and facilitates earlier consideration of wildlife values in wind energy project
- 691 planning. While the USFWS uses the Mitigation Policy for project reviews, developers may
- 692 also use other tools to determine appropriate mitigation. Chapter 4 includes additional
- 693 information regarding the use of mitigation and elements considered by the USFWS during
- 694 mitigation development. Wind developers also should consult with appropriate state
- agencies to ensure compliance with state mitigation requirements.

696 Confidentiality of Site Evaluation Process as Appropriate

- 697 Some aspects of the initial pre-construction risk assessment, including preliminary screening
- and site characterization, occur early in the development process, when land or other
- 699 competitive issues limit developers' willingness to share information on the project with the
- 700 public and competitors. Any consultation or coordination with agencies at this stage may
- 701 include confidentiality agreements.

702 Cumulative Impacts of Project Development

- 703 Cumulative impacts are the comprehensive effect on the environment that results from the
- 704 incremental impact of a project when added to other past, present, and reasonably

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foreseeable future actions. Consideration of cumulative impacts should be incorporated into the wind energy planning process as early as possible to improve decisions. To achieve that goal, it is important that agencies and organizations take the following actions to improve cumulative impacts analyses: review the range of development-related significant adverse impacts; determine which species of concern or their habitats within the landscape are most at risk of significant adverse impacts from wind development in conjunction with other reasonably foreseeable significant adverse impacts; and make that data available for regional or landscape level analysis. The magnitude and extent of the impact on a resource depends on whether the cumulative impacts exceed the capacity for resource sustainability and productivity.

Federal agencies are required to include a cumulative impacts analysis in their NEPA review, including any energy projects that require a federal permit or that have any other federal nexus. The federal action agency coordinates with the developer to obtain necessary information for the NEPA review and cumulative impacts analysis. In order to avoid project delays, federal and state agencies are encouraged to use existing wildlife data for the cumulative impacts analysis until improved data are available.

Where there is no federal nexus, individual developers are not expected to conduct their own cumulative impacts analysis. However, a cumulative impacts analysis would help developers and other stakeholders better understand the significance of potential impacts on wildlife and habitats. Developers are encouraged to coordinate with federal and state agencies early in the project planning process to access any existing information on the cumulative impacts of individual wind energy projects on species and habitats at risk, and to incorporate it into project development and any necessary wildlife studies.

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Landscape Considerations

One important component of the comprehensive landscape database is the identification of large blocks of intact habitat for species of habitat fragmentation concern. Development of this database and identification of these intact habitats is the shared responsibility of the various stakeholders, with a key leadership role to be played by USFWS.

The Secretary of the Interior recently directed USFWS, in cooperation with other DOI agencies, to stimulate the development of a network of collaborative "Landscape Conservation Cooperatives" (LCCs). These LCCs are one approach to identifying large intact habitat for species of habitat fragmentation concern.

Within identified, intact habitats for species of habitat fragmentation concern, it is essential that the anthropogenic factors that may lead to harmful loss and fragmentation be identified. Where possible, BMPs should be developed to avoid or minimize the effects of habitat loss and fragmentation. It may be possible to develop other mitigation measures to offset unavoidable impacts.

- 747 The identification of intact habitats for species of habitat fragmentation concern, and
- 748 development of mitigation measures, should be accomplished through a collaborative
- process, beginning during the phase-in period of implementing the Guidelines and
- continuing as more is learned about the potential habitat impacts of wind energy
- 751 development. Through the implementation of these Guidelines, individual companies can
- 752 provide valuable information that will assist in the collaborative landscape analysis.

D. Research

Much uncertainty remains about predicting risk and estimating impacts of wind energy development on wildlife. Thus there is a need for additional research to improve scientifically based decision-making when siting wind energy facilities, evaluating impacts on wildlife and habitats, and testing the efficacy of mitigation measures. More extensive studies are needed to further elucidate patterns and test hypotheses regarding possible solutions to wildlife and wind energy impacts.

It is in the interests of wind developers and wildlife agencies to improve these assessments to better avoid or minimize the wildlife impacts of wind energy development. The Committee recommends that research to improve predictions of pre-construction risk and estimates of post-construction impacts be a high priority. Research can provide data on operational factors (e.g. wind speed, weather conditions) that are likely to result in fatalities. It could also include studies of cumulative impacts of multiple wind energy projects, or comparisons of different methods for assessing avian and bat activity relevant to predicting risk. Monitoring and research should be designed and conducted to ensure unbiased data collection that meets technical standards such as those used in peer review. Research projects may occur at the same time as project-specific Tier 4 and Tier 5 studies.

Research would usually result from collaborative efforts involving appropriate stakeholders, and is not the sole or primary responsibility of any developer. Research partnerships (e.g., Bats and Wind Energy Cooperative [www.batsandwind.org], Grassland and Shrub Steppe Species Collaborative [www.nationalwind.org]) involving diverse players will be helpful for generating common goals and objectives and adequate funding to conduct studies (Arnett and Haufler 2003). The National Wind Coordinating Collaborative, the American Wind Wildlife Institute, and the California Energy Commission's Public Interest Energy Research Program all support research in this area.

Study sites and access will be required to design and implement research, and developers are encouraged to participate in these research efforts when possible. Subject to appropriations, the USFWS also should fund priority research and promote collaboration and information sharing among research efforts to advance science on wind/wildlife interactions, and to improve these Guidelines.

Chapter Three:

The Tiered Approach for Wildlife Assessment and Siting Decisions

This chapter describes in detail the suggested process for each stage of the tiered approach, with additional sections outlining best practices during site construction, retrofitting, repowering and decommissioning phases of a project.

 The first three tiers correspond to the pre-construction evaluation phase of wind energy development. At each of the three tiers the Guidelines provide a set of questions that the Committee recommends developers attempt to answer, followed by recommended methods and metrics to use in answering the questions. Some questions are repeated at each tier, with successive tiers requiring a greater investment in data collection to answer certain questions. (For example, while Tier 2 investigations may discover some existing information on federal or state listed species and their use of the proposed development site, it may be necessary to collect empirical data in Tier 3 studies to determine the presence of federally or state-listed species).

 The decision to proceed to the next tier is made by the developer. The decision is based on whether all questions identified in the tier have been adequately answered and whether the methods for arriving at the answers were appropriate for the site selected and the risk posed to species of concern and their habitats. Answers indicating little or no risk for all questions in a tier may lead the developer to conclude that the tiered approach may end in that tier, without the necessity to proceed to the next tier. The developer is encouraged to communicate early in the tiered approach with relevant agencies and stakeholders.

A. Tier 1: Preliminary Evaluation or Screening of Potential Sites

For developers taking a first look at a broad geographic area, a preliminary evaluation of the general ecological context of a potential site or sites can serve as useful preparation for coordination with the federal, state, tribal, and/or local agencies. With this internal screening process, the developer can begin to identify broad geographic areas of high sensitivity due to: 1) the presence of large blocks of intact native landscapes, 2) intact ecological communities, 3) fragmentation-sensitive species' habitats, or 4) other important landscape-scale wildlife values.

Tier 1 may be used in any of the following three ways:

- To identify regions where wind energy development poses substantial risks to species of
 concern or their habitats, including the fragmentation of large-scale habitats and threats
 to regional populations of federal- or state-listed species
- 2. To "screen" a landscape or set of multiple potential sites in order to avoid those thathave the highest habitat values
- 3. To begin to determine if a single identified potential site poses serious risk to species of concern or their habitats

Tier 1 can offer early guidance about the sensitivity of the site within a larger landscape context; it can help direct development away from sites that will be associated with higher study, mitigation costs, and uncertainty; or it can identify those sensitive resources that will need to be studied further to determine if the site can be developed without significant adverse impacts to the species of concern or local population(s). This may facilitate discussions with the federal, state, tribal, and/or local agencies in a region being considered for development. In some cases, Tier 1 studies could reveal serious concerns indicating that a site should not be developed.

Development in some areas may be precluded by federal law. This designation is separate from a determination through the tiered approach that an area is not appropriate for development due to feasibility, ecological or other issues. Developers are encouraged to visit USFWS databases or other available information during Tier 1 or Tier 2 to see if a potential wind energy area is precluded from development by federal law. Some areas may be protected from development through state or local laws or ordinances and the appropriate agency should be contacted accordingly. It may be appropriate to coordinate with the local USFWS office if there are questions regarding the designation and how it may apply to wind energy development.

Comment [ejk1]: The Synthesis Workgroup has not fully agreed to this language, and it requires FAC discussion.

It should be noted that some areas may be inappropriate for large scale development, based solely on their ecological rarity and intactness. It is important to identify such areas through the tiered approach, as reflected in Tier 1 Question 2 below; and appropriate decisions to mitigate for impacts to them is the key facet of a Tier 1 evaluation. Many of North America's native landscapes are greatly diminished, with some existing at less that 10 percent of their pre-settlement occurrence. Herbaceous sub-shrub steppe in the Pacific Northwest and old growth forest in the Northeast are representative of such diminished native resources. Important remnants of these landscapes are identified and documented in various data bases held by private conservation organizations, state wildlife agencies, and in some cases by USFWS. Developers should collaborate with such entities specifically about such areas in the vicinity of a prospective project site.

- 859 Tier 1 Questions
- 860 Suggested questions to be considered in Tier 1 include:

- 1. Are there species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?
 - 2. Does the landscape contain areas where development is precluded by law or areas designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: 'areas of scientific importance'; 'areas of significant value'; federally-designated critical habitat; high-priority conservation areas for non-government organizations; or other local, state, regional, federal, tribal, or international categorizations.
 - 3. Are there known critical areas of wildlife congregation, including, but not limited to, maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?
 - 4. Are there large areas of intact habitat with the potential for fragmentation, with respect to species of habitat fragmentation concern needing large contiguous blocks of habitat?

Tier 1 Methods and Metrics

Developers who choose to conduct Tier 1 investigations would probably utilize existing public or other readily available landscape-level maps and databases from sources such as federal, state, or tribal wildlife or natural heritage programs, the academic community, conservation organizations, or the developer's or consultant's own information. It is recommended that developers conduct a review of the publicly available data, and the analysis of available sites in the region of interest will be based on a blend of the information available in published and unpublished reports, wildlife range distribution maps, and other such sources. Currently available data sources useful for this analysis are listed in Appendix C. It is recommended that the developer check with the USFWS field office for data specific

886 Use of Tier 1 Information

to wind energy development and wildlife.

The objective of the Tier 1 process is to help the developer identify a site or sites to consider further for wind energy development. Possible outcomes of this internal screening process include the following:

- One or more sites are found within the area of investigation where the answer to
 each of the above Tier 1 questions is "no," indicating a low probability of significant
 adverse impact to wildlife. The developer proceeds to Tier 2 investigations and
 characterization of the site or sites, answering the Tier 2 questions with site-specific
 data to confirm the validity of the preliminary indications of low potential for
 significant adverse impact.
- 2. A "Yes" answer to one or more of the Tier 1 questions indicate a higher probability of significant adverse impacts to wildlife. Investigation of the area may be abandoned,

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- 3. or effort may be devoted to identifying possible means by which the project can be modified to avoid or minimize <u>significant adverse</u> impacts.
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4. The data available in the sources described above is insufficient to answer one or more of the Tier 1 questions. The developer proceeds to Tier 2, with a specific emphasis on collecting the data necessary to answer the Tier 2 questions, which are inclusive of those asked at Tier 1.

B. Tier 2: Site Characterization

At this stage the developer has narrowed consideration down to specific sites, and 906 additional data may be necessary to systematically and comprehensively characterize a 907 908 potential site in terms of the risk wind energy development would pose to species of concern and their habitats. In the case where a site or sites have been selected without the 909 Tier 1 preliminary evaluation of the general ecological context, Tier 2 becomes the first stage 910 in the site selection process. The developer will address the questions asked in Tier 1; if 911 addressing the Tier 1 questions here, the developer will evaluate the site within a landscape 912 context. However, a distinguishing feature of Tier 2 studies is that they focus on site-specific 913 information and should include at least one visit to each of the prospective site(s). Because 914 915 Tier 2 studies are preliminary, normally one reconnaissance level Site visit will be adequate as a 'ground-truth' of available information. Notwithstanding, if key issues are identified that 916 relate to varying conditions and/or seasons, Tier 2 studies should include enough Site visits 917 918 during the appropriate times of the year to adequately assess these issues for the 919 prospective site(s).

920 Tier 2 Questions

Questions suggested for Tier 2 can be answered using credible publicly available information that includes published studies, technical reports, databases, and information from agencies, local conservation organizations, and/or local experts. Developers or consultants working on their behalf should contact the federal, state, tribal, and local agencies that have jurisdiction or management authority and responsibility over the potential project.

- Are there known species of concern present on the proposed site, or is habitat
 (including designated critical habitat) present for these species?
 - 2. Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: 'areas of scientific importance'; 'areas of significant value'; federally-designated critical habitat; high-priority conservation areas for non-governmental organizations; or other local, state, regional, federal, tribal, or international categorization.
 - 3. Are there plant communities of concern present or likely to be present at the site(s)?
 - 4. Are there known critical areas of congregation of species of concern, including, but not limited to, maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?

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- 5. Using best available scientific information, has the relevant federal, state, tribal, and/or local agency independently demonstrated the potential presence of a population of a species of habitat fragmentation concern? If not, the developer need not assess impacts of the proposed project on habitat fragmentation.
- 6. Which species of birds and bats, especially those known to be at risk caused by wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?

Tier 2 Methods and Metrics

Obtaining answers to Tier 2 questions will involve a more thorough review of the existing site-specific information than in Tier 1. Tier 2 site characterization studies will generally contain three elements:

- A) A review of existing information, including existing published or available literature and databases and maps of topography, land use and land cover, potential wetlands, wildlife, habitat, and sensitive plant distribution. This information can also help identify potential habitat for species of habitat fragmentation concern.
- B) Contact with agencies and organizations who have relevant scientific information to further help identify if there are avian, bat or other wildlife issues. It is recommended that the developer make contact with federal, state, tribal, and local agencies that have jurisdiction or management authority over the project or information about the potentially affected resources. In addition, because key non-governmental organizations (NGOs) and relevant local groups are often valuable sources of relevant local environmental information, it is recommended that developers contact key NGOs, even if confidentiality concerns preclude the developer from identifying specific project location information at this stage. These contacts also provide an opportunity to identify other potential issues and data not already identified by the developer.
- C) One or more reconnaissance level Site visits by a wildlife biologist to evaluate current vegetation/habitat coverage and land management/use. Current habitat and land use practices will be noted to help in determining the baseline against which potential impacts from the project would be evaluated. The vegetation/ habitat will be used for identifying potential avian and bat resources occurring at the Site and the potential presence of, or suitable habitat for, species of concern. Vegetation types or habitats will be noted and evaluated against available information such as land use/land cover mapping. Any sensitive resources located during the Site visit will be noted and mapped or digital location data recorded for future reference. Any individuals or sign of species of concern that are observed during the Site visit will be noted. If land access agreements are not in place, access to the site will be limited to public roads.

Specific resources that can help answer each Tier 2 guestion include:

980 1. Are there known species of concern present on the proposed site, or is habitat 981 (including designated critical habitat) present for these species?

Information review and agency contact: Locations of state and federally listed, proposed and candidate species and Species of Concern are frequently documented in state and federal wildlife databases. Examples include published literature such as: Natural Heritage Databases, State Wildlife Action Plans, NGOs publications, and developer and consultant information, or can be obtained by contacting these entities.

Site visit: To the extent practicable, the Site visit(s) should evaluate the suitability of habitat at the Site for species identified and the likelihood of the project to adversely affect the species of concern that may be present.

- 2. Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: 'areas of scientific importance'; 'areas of significant value'; federally-designated critical habitat; high-priority conservation areas for non-governmental organizations; or other local, state, regional, federal, tribal, or international categorization.
 - Information review and agency contact such as: Maps of political and administrative boundaries, National Wetland Inventory data files, USGS National Land Cover data maps; state, federal and tribal agency data on areas that have been designated to preclude development, including wind energy development; State Wildlife Action Plans, State Land and Water Resource Plans, Natural Heritage databases, scientifically credible information provided NGO and local resources, and the additional resources listed in Appendix C of this document, or through contact of agencies and NGOs, to determine the presence of high priority habitats for species of concern or conservation areas.
 - Site Visit: To the extent practicable the Site visit(s) should characterize and evaluate the uniqueness of the site vegetation relative to surrounding areas.
 - 3. Are there plant communities of concern present or likely to be present at the site(s)? Information review and agency contact such as: Natural Heritage Data of state rankings (S1, S2, S3) or globally (G1, G2, G3) ranked rare plant communities.

 Site Visit: To the extent practicable, the Site visit should evaluate the topography, physiographic features and uniqueness of the site vegetation in relation to the surrounding region.
- 4. Are there known critical areas of wildlife congregation, including, but not limited to, maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?
 - Information review and agency contact such as: Existing databases, State Wildlife Action Plan, Natural Heritage Data, and NGO and agency information regarding the presence of Important Bird Areas, migration corridors or stopovers, leks, bat

hibernacula or maternity roosts, or game winter ranges at the site and in the surrounding area.

Site Visit: To the extent practicable, the Site visit should evaluate the topography, physiographic features and uniqueness of the site in relation to the surrounding region to assess the potential for the project area to concentrate resident or migratory birds and bats.

5. Using best available scientific information, has the relevant federal, state, tribal, and/or local agency independently demonstrated the potential presence of a population of a species of habitat fragmentation concern? If not, the developer need not assess impacts of the proposed project on habitat fragmentation.

Habitat fragmentation is defined as the separation of a block of habitat for a species into segments, such that the genetic or demographic viability of the populations surviving in the remaining habitat segments is reduced; and risk, in this case, is defined as the probability that this fragmentation will occur as a result of the project. Site clearing, access roads, transmission lines and turbine tower arrays remove habitat and displace wildlife, and may fragment continuous habitat areas into smaller, isolated tracts. Habitat fragmentation is of particular concern when species require large expanses of habitat for activities such as breeding and foraging.

Consequences of isolating local populations of some species include decreased reproductive success, reduced genetic diversity, and increased susceptibility to chance events (e.g. disease and natural disasters), which may lead to extirpation or local extinctions. In addition to displacement, development of wind energy infrastructure may result in additional loss of habitat due to "edge effects" resulting from the break-up of continuous stands of similar vegetation resulting in an interface between two or more types of vegetation. Edge effects can extend a mile or more into remaining habitat fragments, and can result in a greater susceptibility to colonization by invasive species and competing species favoring landscapes with a mosaic of vegetation.

A general framework for evaluating habitat fragmentation at a project site in Tier 2 is outlined below. Developers and USFWS may use this method to analyze the impacts of habitat fragmentation at wind development project sites on species of habitat fragmentation concern. USFWS offices can provide the available information on habitat types, quality and intactness. Developers may use this information in combination with site-specific information on the potential habitats to be impacted by a potential development and how they will be impacted. The USFWS will use the collective information from all potential impacts within the larger landscape to determine whether the habitat impacts, including habitat fragmentation, is likely to affect population viability of the potentially effected species of habitat fragmentation concern.

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The developer should define the study area. The study area should include the Project Site for the proposed facility. The extent of the study area should be based on

- 1062 the distribution of habitat for the local population of the species of habitat 1063 fragmentation concern. The developer should analyze the current habitat quality and spatial configuration of 1064 В. 1065 the study area for the species of habitat fragmentation concern. Use recent aerial and remote imagery to determine distinct habitat patches, or 1066 1067 boundaries, within the study area, and the extent of existing habitat fragmenting features (e.g., highways). 1068 ii. Assess the level of fragmentation of the existing habitat for the species of habitat 1069 1070
 - fragmentation concern and categorize into three classes:
 - High quality: little or no apparent fragmentation of intact habitat
 - Medium quality: intact habitat exhibiting some recent disturbance activity (i.e., ORV trails, roadways),
 - Low quality: Extensive fragmentation of habitat (e.g., row-cropped agricultural lands, active surface mining areas)
 - C. The developer should determine potential changes in quality and spatial configuration of the habitat in the study area if development were to proceed as proposed using existing site information.
- The USFWS will use the collective information from steps A-C for all potential 1081 D. developments to assess whether the habitat impacts, including habitat 1082 fragmentation, is likely to affect population viability of the potentially effected 1083 species of habitat fragmentation concern. 1084
- 1086 Which species of birds and bats, especially those known to be at risk caused by wind 6. energy facilities, are likely to use the proposed site based on an assessment of site 1087 attributes? 1088

Information review and agency contact: Existing published information and databases, NGOs and from federal and state resource agencies regarding the potential presence of:

- Raptors: species potentially present by season,
- Prairie grouse: species potentially present by season and location of known
- Other birds: species potentially present by season that may be at risk of collision or adverse impacts to habitat, including loss, displacement and fragmentation.
- Bats: species likely to be impacted by wind energy facilities and likely to occur on or migrate through the site

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Site Visit: To the extent practicable, the Site visit(s) should identify landscape feature or habitats that could be important to raptors, prairie grouse, other birds that may be at risk of adverse impacts, and bats, including nesting and brood-rearing habitats, areas of high prey density, movement corridors and features such as ridges that may concentrate raptors. Raptors, prairie grouse, and other presence or sign of species of concern seen during the Site visit should be noted, with species identification if possible.

Tier 2 Decision Process

Possible outcomes of Tier 2 include the following:

- 1. The most likely outcome of Tier 2 is that the answer to one or more Tier 2 questions is inconclusive to address wildlife risk, either due to insufficient data to answer the question or because of uncertainty about what the answers indicate (for example, Tier 2 site characterization may capture the presence of features indicating wildlife congregation, but may not capture seasonality and spatial variation of wildlife use). The developer proceeds to Tier 3, formulating questions, methods, and assessment of potential mitigation measures based on issues raised in Tier 2 results.
- 2. Sufficient information is available to answer all Tier 2 questions, and the answer to each Tier 2 question indicates a low probability of adverse impact to wildlife (for example, infill or expansion of an existing facility where impacts have been low and Tier 2 results indicate that conditions are similar, therefore wildlife risk is low). The developer may then decide to proceed to permitting (if required), design, and construction following best management practices (see Chapter Three, section D).
- 3. The answers to one or more Tier 2 questions indicate a high probability of significant adverse impacts to species of concern or their habitats that cannot be mitigated. The proposed site should be abandoned.

 C. Tier 3: Field Studies to Document Site Wildlife Conditions and Predict Project Impacts

Tier 3 is the first tier in which quantitative and scientifically rigorous studies would be conducted to assess the potential risk of the proposed project. Specifically, these studies provide pre-construction information to:

- Further evaluate a site for determining whether the project should be developed or be abandoned
- Design and operate a site to avoid or minimize <u>adverse</u> impacts if a decision is made to develop;
- Design compensatory mitigation measures if significant <u>adverse</u> habitat impacts cannot acceptably be avoided or minimized;

- Determine if post-construction studies are necessary; and,
 - If warranted, provide the pre-construction component of Tier 5 studies necessary to estimate impacts.

Not all Tier 3 studies will continue into Tiers 4 or 5. For example, surveys conducted in Tier 3 for species of concern may indicate one or more species are not present at the proposed site, or siting decisions could be made in Tier 3 that remove identified concerns; thus obviating the need for continued efforts in later tiers. Additional detail on the design of Tier

5 studies that begin in Tier 3 is provided in the discussion of methods and metrics in Tier 5.

1147 Tier 3 Questions

Tier 3 begins as the other tiers do, with problem formulation: what additional studies are required to enable a decision as to whether the proposed project can proceed to construction or operation or should be abandoned? This step includes an evaluation of data gaps identified by Tier 2 studies as well as the gathering of data necessary to:

- design a project to avoid or minimize predicted risk;
- evaluate predictions of impact and risk through post-construction comparisons of estimated impacts (i.e., Tier 4 and 5 studies); and
- identify compensatory mitigation measures if appropriate to offset unavoidable significant adverse impacts.

The decision to conduct a Tier 3 study depends on whether or not additional data are necessary to answer the questions listed below. The duration, seasonality, and level of effort required to answer each Tier 3 question depends on several factors, including but not limited to: the question being addressed; site sensitivity; amount and quality of existing data from nearby comparable sites with similar species and their habitats; seasons of occupancy; variability within and between seasons and years where such variability is likely to substantially affect answers to the Tier 3 questions; and affected species of concern. Existing state and federal agency protocols will have established study duration and level of effort for some species. When such established protocols are not available, or the developer believes it has good cause not to apply them, the developer should coordinate with federal or state natural resource agencies, or other credible experts as appropriate, on project-specific conditions, and design studies that collect sufficient data to answer Tier 3 questions.

If, for example, adequate data are available from nearby sources or from studies of the site being evaluated, then additional studies may be unnecessary. A reduced level of survey effort may be warranted for certain projects, such as infill development, projects with low potential risk for <u>adverse</u> impacts, some repowering projects, or projects contiguous to existing low-impact wind energy facilities – provided these projects have sufficient credible information regarding impacts. More effort and longer duration may be needed for uncommon or rare species of concern; when there is little existing information; or when

deviation from normal environmental conditions (e.g., drought years) or variability in the metric(s) of interest (e.g., bat activity) is considered so high that it is not otherwise possible to categorize risk as high, moderate or low.

The problem formulation stage for Tier 3 also will include an assessment of which of the species identified in Tier 1 and/or Tier 2 will be studied further in the site risk assessment. This determination is based on analysis of existing data from Tier 1 and existing site-specific data and Site visit(s) in Tier 2, and on the likelihood of presence and the degree of adverse impact to species or their habitat. If the habitat is suitable for a species needing further study and the site occurs within the historical range of the species, or it is near the existing range of the species but presence has not been documented, additional field studies may be appropriate. Additional analyses should not be necessary if a species is unlikely to be present or is present but <u>adverse</u> impact is unlikely or of minor significance.

 Tier 3 studies address many of the questions identified for Tiers 1 and 2, but Tier 3 studies differ because they attempt to quantify the distribution, relative abundance, behavior, and site use of species of concern. Tier 3 data also attempt to estimate the extent that these factors expose these species to risk from the proposed wind energy facility. Therefore, in answering Tier 3 questions 1-3, developers should collect data sufficient to analysis and answer Tier 3 questions 4-6.

Tier 3 studies should be designed to answer the following questions:

1200 1. D

 Do field studies indicate that species of concern are present on or likely to use the proposed site?

 2. Do field studies indicate the potential for significant adverse impacts on the affected population of the species of habitat fragmentation concern?

 3. What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed wind energy project?

 4. What are the potential risks of <u>adverse</u> impacts of the proposed wind energy project to individuals and local populations of species of concern? (In the case of rare or endangered species, what are the possible impacts to entire species and their habitats?)

mitigated?

6. Are there studies that should be initiated at this stage that would be continued in

5. If adverse impacts are predicted to species of concern, can these impacts be

Deleted: significant

6. Are there studies that should be initiated at this stage that would be continued in either Tier 4 or Tier 5?

Tier 3 Methods and Metrics

If Tier 3 studies are warranted, the Committee encourages the use of methods and metrics that are common to all similar Tier 3 studies for measuring wildlife activity and habitat features. Common methods and metrics provide great benefit over the long-term, allowing for comparisons among projects and for greater certainty regarding what will be asked of the developer for a specific project. Varying from commonly used methods should be carefully considered, scientifically justifiable and discussed with federal, tribal, or state natural resource agencies, or other credible experts, as appropriate. It may be useful to consult other scientifically credible information sources.

Tier 3 studies will be designed to accommodate local and regional characteristics. The specific protocols by which common methods and metrics are implemented in Tier 3 studies depends on the question being addressed, the species or ecological communities being studied and the characteristics of the study sites. Federally listed threatened and endangered species, and some other species of concern and their habitats, may have specific protocols required by local, state or federal agencies. The need for special surveys and mapping that address these species and situations should be discussed with the appropriate stakeholders.

 In some instances, a single method will not adequately assess potential collision risk or habitat impact. For example, when there are moderate to high levels of concern about risk to nocturnally active species, such as migrating passerines and local and migrating bats, a combination of remote sensing tools such as radar, and acoustic monitoring for bats and indirect inference from diurnal bird surveys during the migration period may be necessary. Answering questions about habitat use by songbirds may be accomplished by relatively small-scale observational studies, while answering the same question related to wideranging species such as prairie grouse and sage grouse may require more time-consuming surveys, perhaps including telemetry.

 Because of the points raised above and the need for flexibility in application, the Committee does not make specific recommendations on protocol elements for Tier 3 studies. The peer-reviewed scientific literature (such as those articles cited below) contains numerous recently published reviews of methods for assessing avian and bat activity, and tools for assessing habitat and landscape level risk are also available. Details on specific methods and protocols for recommended studies are or will be widely available and should be consulted by industry and agency professionals.

Many methods for assessing risk are components of active research involving collaborative efforts of public-private research partnerships with federal, state and tribal agencies, wind energy developers and non-governmental organizations interested in wind-wildlife interactions (e.g., Bats and Wind Energy Cooperative; www.batsandwind.org and the Grassland Shrub Steppe Species Cooperative; www.nationalwind.org). Thus, while recognizing the value of utilizing common methods, the Committee also recognizes the

need to integrate the results of research that improves existing methods or describes new methodological developments.

The remainder of this section outlines the methods and metrics which may be appropriate for gathering data to answer Tier 3 questions. Each question is considered in turn, followed by a discussion of the methods and their applicability.

1. Do field studies indicate that species of concern are present on or likely to use the proposed site?

2. Specific presence/absence studies may not be required, and protocol development will focus on answering the remaining Tier 3 questions. Nevertheless, it may be necessary to conduct field studies to determine the presence, or likelihood of presence, when little information is available for a particular site. The level of effort normally contemplated for Tier 3 studies should detect common species and species that are relatively rare, but which visit a site regularly (i.e., every year). In the event a species of concern is very rare and only occasionally visits a site a determination of "likely to occur" would be inferred from the habitat at the site and historical records of occurrence on or near the site.

In many situations this question can be answered based on information accumulated in Tier

State, federal and tribal agencies often require specific protocols be followed when species of concern are potentially present on a site. The methods and protocols for determining presence of species of concern at a site are normally established for each species and required by federal, state and tribal resource agencies. Surveys should sample the wind turbine sites and applicable disturbance area during seasons when species are most likely present. Normally the methods and protocols by which they are applied also will include an estimate of relative abundance. Most presence/absence surveys should be done following a probabilistic sampling protocol to allow statistical extrapolation to the area and time of interest.

Acoustic monitoring can be a practical method for determining the presence of threatened, endangered or otherwise rare species of bats throughout a proposed wind energy project (Kunz et al. 2007). There are two general types of acoustic detectors that are used for collection of information on bat activity and species identification, the full-spectrum time-expansion and the zero-crossing techniques for ultrasound bat detection (see Kunz et al. 2007 for detailed discussion). Full-spectrum time expansion detectors provide nearly complete species discrimination, while zero-crossing detectors provide reliable and cost-effective estimates of total bat use at a site and provide some species discrimination, Myotis species can be especially difficult to discriminate with zero-crossing detectors (Kunz et al. 2007). Kunz et al. (2007) describe the strengths and weaknesses of each technique for ultrasonic bat detection, and either type of detector may be useful in most situations except where species identification is especially important and zero-crossing methods are inadequate to provide the necessary data. Bat acoustics technology is evolving rapidly and study objectives are an important consideration when selecting detectors. When rare or

endangered species of bats are suspected, sampling should occur during different seasons and at multiple sampling stations to account for temporal and spatial variability.

Mist-netting bats is required in some situations by state agencies, tribes, and the USFWS to determine the presence of threatened, endangered or otherwise rare species. Mist-netting is best used in combination with acoustic monitoring to inventory the species of bats present at a site, especially to detect presence of threatened or endangered species. Efforts should concentrate on potential commuting, foraging, drinking, and roosting sites (Kuenzi and Morrison 1998, O'Farrell et al. 1999). Mist-netting and other activities that involve capturing and handling threatened or endangered species of bats will require permits from state and/or federal agencies.

Determining the presence of diurnally or nocturnally active mammals, reptiles, amphibians, and other species of concern will typically be accomplished by following agency-required protocols. Most listed species have required protocols for detection (e.g., black-footed ferret). State, tribal and federal agencies should be contacted regarding survey protocols for those species of concern. See Corn and Bury 1990, Olson et al. 1997, Bailey et al. 2004, Graeter et al. 2008 for examples of reptile and amphibian protocols, survey and analytical methods.

Do field studies indicate significant adverse impacts on species of habitat fragmentation concern?

If areas of intact habitat supporting a population of a species of habitat fragmentation concern were identified in Tier 1 or Tier 2, but existing information did not allow for a complete analysis of potential impacts and decision-making, then additional studies and analyses should take place in Tier 3.

 As in Tier 2, the particulars of the analysis will depend on the species of habitat fragmentation concern and how habitat block size and fragmentation are defined for the life cycles of that species, the likelihood that the wind energy project will adversely affect a local population of the species and the significance of these impacts to the viability of that population.

To assess habitat fragmentation in the project vicinity developers should evaluate landscape characteristics of the proposed site prior to construction and determine the degree to which habitat for species of habitat fragmentation concern will be significantly altered by the presence of a wind energy facility.

A general framework for a method for evaluating habitat fragmentation at a project site, following that described in Tier 2, is outlined below. This method for analysis of habitat fragmentation at wind energy development project sites must be adapted to the local population of the species of habitat fragmentation concern potentially affected by the proposed development.

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1. The developer should define the study area. The study area for the site should include the "footprint" for the proposed facility plus an appropriate surrounding area. The extent of the study area should be based on the distribution of habitat for the species of habitat fragmentation concern and the potential for significant adverse habitat impacts, including displacement.

Comment [ejk2]: Synthesis has agreed to this section in concept, but it requires further review and language revisions may be proposed.

- 2. The developer should determine the potential for occupancy of the study area based on the guidance provided for the species of habitat fragmentation concern described above under question 1.
- The developer should analyze current habitat quality and spatial configuration of the study area for the species of habitat fragmentation concern.
 - Use recent aerial or remote imagery to determine distinct habitat patches, or boundaries, within the study area, and the extent of existing habitat fragmenting features.

Assess the level of fragmentation of the existing habitat for the species of habitat fragmentation concern and categorize into three classes:

- High quality: little or no apparent fragmentation of intact habitat
- Medium quality: intact habitat exhibiting some recent disturbance activity (e.g., timber clearing, ORV trails, roadways),
- Low quality: Extensive fragmentation of habitat (e.g., row-cropped agricultural lands, active surface mining areas)

Determine edge and interior habitat metrics of the study area:

- Buffer non-habitat cover and fragmenting features appropriate for the species of habitat fragmentation concern, in order to estimate existing edge
- Calculate area and acres of edge.
- Calculate area of intact patches of habitat and compare to needs of species of habitat fragmentation concern.
- b. Determine potential changes in quality and spatial configuration of the habitat in the study area if development proceeds as proposed using existing site information and the best available spatial data regarding placement of wind turbines and ancillary infrastructure.
 - Identify, delineate, and classify all additional features added by the development that potentially fragment habitat for the species of habitat fragmentation concern (e.g., roads, transmission lines, maintenance structures, etc.).
 - Assess the expected future size and quality of habitat patches for the species
 of habitat fragmentation concern and the additional fragmenting features,
 and categorize into three classes as described above.
 - Determine expected future acreages of edge and interior habitats.
 - Calculate the area of the remaining patches of intact habitat.

- c. Compare pre-construction and expected post-construction fragmentation metrics
 - Determine the area of intact habitat lost (to the displacement footprint or by alternation due to the edge effect)
 - Identify habitat patches that are expected to be moved to a lower habitat quality classification as a result of the development
- d. USFWS will assess the likelihood of a significant reduction in the demographic and genetic viability of the local population of the species of habitat fragmentation concern using the information provided by the developer and other credible sources, as described above. Based on this assessment, if USFWS finds that the analysis shows the likelihood of a significant reduction, the developer should consider items e and f below.
- e. Consider alternative locations and development configurations to minimize fragmentation of habitat in consultation with taxonomic experts, for all species of habitat fragmentation concern in the area of interest
- f. Aid mitigation efforts by identifying high quality habitat parcels that may be protected as part of a plan to limit future loss of habitat for the impacted population of the species of habitat fragmentation concern in the area. The USFWS field office can assist with the identification of high quality habitat parcels.
- g. Identify areas of medium or low quality habitat within the range of the impacted population that may be restored or improved to compensate for losses of habitat that result from the project (e.g., management of unpaved roads and ORV trails).

This protocol for analysis of habitat fragmentation at wind energy project sites must be adapted to the species of habitat fragmentation concern and ecosystem type in which development is contemplated.

3. What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed wind energy project?

For those species of concern that are considered at risk of collisions or habitat impacts, the questions to be answered in Tier 3 include: where are they likely to occur (i.e., where is their habitat) within a project site or vicinity, when might they occur, and in what abundance. The spatial distribution of species at risk of collision can influence how a site is developed. This distribution should include the airspace for flying species with respect to the rotor-swept zone. The abundance of a species and the spatial distribution of its habitat can be used to determine the relative risk of impact to species using the sites, and the absolute risk when compared to existing wind energy projects where similar information exists. Species abundance and habitat distribution can also be used in modeling risk factors.

- 1428 Surveys for spatial distribution and relative abundance require coverage of the wind turbine
- sites and applicable site disturbance area, or a sample of the area using observational
- methods for the species of concern during the seasons of interest. As with
- presence/absence (see Tier 3, question #1, above) the methods used to determine
- distribution, abundance, and behavior may vary with the species and its ecology. Spatial
- distribution is determined by applying presence/absence or use surveys in a probabilistic
- manner over the entire area of interest.

Bird Distribution, Abundance, Behavior and Site Use

Diurnal Avian Activity Surveys

The commonly used data collection methods for estimating the spatial distribution and relative abundance of diurnal birds includes counts of birds seen or heard at specific survey points (point count) or along transects (transect surveys). Both methods result in estimates of bird use, which are assumed to be indices of abundance in the area surveyed; absolute abundance is difficult to determine for most species and is not necessary to evaluate species risk. Surveys for raptor and other large bird use should be done using point counts. Depending on the characteristics of the area of interest and the bird species potentially affected by the project, additional pre-construction study methods may be necessary. Point counts or line transects should collect vertical as well as horizontal data to identify levels of activity within the rotor-swept zone.

Avian point counts should follow the general methodology described by Reynolds et al. (1980) for point counts within a fixed area, or the line transect survey similar to Schaffer and Johnson (2008), where all birds seen within a fixed distance of a line are counted. These methods are most useful for pre- and post-construction studies to quantify avian use of the project site by habitat, determine the presence of species of concern, and to provide a baseline for assessing displacement effects and habitat loss. Point counts for large birds (e.g., raptors) follows the same point count method described by Reynolds et al. (1980).

 Point count plots or transects should allow for statistical extrapolation of data and be distributed throughout the area of interest using a probability sampling approach (e.g., systematic sample with a random start). For most projects, the area of interest is the area where wind turbines and permanent meteorological towers are proposed or are expected to be sited. Alternatively, the centers of the larger plots can be located at vantage points throughout the potential area being considered with the objective of covering most of the area of interest. Flight height should also be collected to focus estimates of use on activity occurring in the rotor-swept zone.

 Sampling duration and frequency will be determined on a project-by-project basis and by the questions being addressed. The most important consideration for sampling frequency when estimating abundance is the amount of variation expected among survey dates and locations and the species of concern.

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The use of comparable methods and metrics should allow data comparison from plot to plot within the area of interest and from site to site where similar data exist. The data should be collected so that avian activity can be estimated within the rotor-swept zone. Relating use to site characteristics requires that samples of use also measure site characteristics thought to influence use (i.e., covariates such as vegetation and topography) in relation to the location of use. The statistical relationship of use to these covariates can be used to predict occurrence in unsurveyed areas during the survey period and for the same areas in the future.

Surveys should be conducted at different intervals during the year to account for variation in expected bird activity with lower frequency during winter months if avian activity is low. Sampling frequency should also consider for the episodic nature of activity during fall and spring migration. Standardized protocols for estimating avian abundance are well-established and should be consulted (e.g., Dettmer et al. 1999). If a more precise estimate of density is required for a particular species (for example, when the goal is to determine densities of a special-status breeding bird species), the researcher will need more sophisticated sampling procedures, including estimates of detection probability.

Raptor Nest Searches

An estimate of raptor use of the project site is obtained through the point counts, but if potential impacts to breeding raptors are a concern on a project, raptor nest searches are also recommended. These surveys provide information to predict risk to the local breeding population of raptors, for micro-siting decisions, and for developing an appropriately sized non-disturbance buffer around nests. Surveys also provide baseline data for estimating impacts and determining mitigation requirements.

Searches for raptor nests or raptor breeding territories on projects with potential for impacts to raptors should be conducted in suitable habitat for the species of concern during the breeding season. While there is no consensus on the recommended buffer zones around nest sites to avoid disturbance of most species (Sutter and Jones 1981), a nest search within at least one mile of the wind turbines and transmission lines should locate most raptor nests potentially affected by the development.

Methods for these surveys are fairly common and will vary with the species, terrain, and vegetation within the survey area. It is recommended that draft protocols be discussed with biologists from the lead agency, USFWS, state wildlife agency, and tribes where they have jurisdiction. It may be useful to consult other scientifically credible information sources. At minimum, the protocols should contain the list of target raptor species for nest surveys and the appropriate search protocol for each site, including timing and number of surveys needed, search area, and search techniques.

Prairie Grouse and Sage Grouse Population Assessments

Sage grouse and prairie grouse merit special attention in this context because:

- The scale and biotic nature of their habitat requirements uniquely positions them as reliable indicators of impacts on, and needs of, a suite of species that depend on sage and grassland habitats, which are among the nation's most diminished ecological communities (North American Grouse Partnership 2007).
- 2. Their ranges and habitats are highly congruent with the nation's richest inland wind resources; and
- 3. They are species for which some known impacts of anthropogenic features (e.g., tall structures, buildings, roads, transmission lines, wind energy facilities, etc.) have been documented.

Populations of prairie grouse and sage grouse generally are assessed by either lek counts (a count of the maximum number of males attending a lek) or lek surveys (classification of known leks as active or inactive) during the breeding season (e.g., Connelly et al. 2000). Methods for lek counts vary slightly by species but in general require repeated visits to known sites and a systematic search of all suitable habitat for leks, followed by repeated visits to active leks to estimate the number of grouse using them.

 Recent research indicates that viable prairie grouse and sage grouse populations are dependent on suitable nesting and brood-rearing habitat. These habitats generally are associated with leks. Leks are the approximate centers of nesting and brood-rearing habitats (Connelly et al. 2000, but see Connelly et al. 1988; Becker et al. 2009). Nesting and brood-rearing habitats may extend several miles from leks. Greater and lesser prairie-chickens generally nest within 1 to 2 miles of active leks (Hagen et al. 2004), whereas the average distances from nests to active leks of sage grouse range from 0.7 to 4 miles (up to 13 miles for migratory populations) (Connelly et al. 2000). High quality nesting and brood-rearing habitats surrounding leks are critical to sustaining viable prairie grouse and sage grouse populations (Giesen et al. 1993, Hagen et al. 2004, Connelly et al. 2000).

While surveying leks during the spring breeding season is the most common and convenient tool for monitoring population trends of prairie grouse and sage grouse, documenting available nesting and brood rearing habitat within and adjacent to the potentially affected area is recommended. Suitable nesting and brood rearing habitat can be mapped based on habitat requirements of individual species. The distribution and abundance of nesting and brood rearing habitat can be used to help in the assessment of adverse.impacts of the proposed wind energy project to prairie grouse and sage grouse.

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Mist-Netting for Birds

Mist-netting is not recommended as a method for assessing risk of wind development. Mist-netting cannot generally be used to develop indices of relative bird abundance, nor does it provide an estimate of collision risk as mist-netting is not feasible at the heights of the rotor-swept zone and captures below that zone may not adequately reflect risk. Operating mist-nets is expensive and requires considerable experience, as well as state and federal permits.

Occasionally mist-netting can help confirm the presence of rare species at documented fallout or migrant stopover sites near a proposed project. If mist-netting is to be used, it is recommended that procedures for operating nets and collecting data be followed in accordance with Ralph et al. (1993).

Nocturnal Bird Survey Methods

Additional studies using different methods will be required if characteristics of the project site and surrounding areas potentially pose a high risk of collision to night migrating songbirds and other nocturnally active species. For most of their flight, songbirds and other nocturnal migrants are above the reach of wind turbines, but they pass through the altitudinal range of wind turbines during ascents and descents and may also fly closer to the ground during inclement weather (Able, 1970; Richardson, 2000). Factors affecting flight path, behavior, and "fall-out" locations of nocturnal migrants are reviewed elsewhere (e.g., Williams et al., 2001; Gauthreaux and Belser, 2003; Richardson, 2000; Mabee et al., 2006).

In general, pre-construction nocturnal studies are not recommended unless the site has features that might strongly concentrate nocturnal birds, such as along coastlines that are known to be migratory songbird corridors. Biologists knowledgeable about nocturnal bird migration and familiar with patterns of migratory stopovers in the region should assess the potential risks to nocturnal migrants at a proposed wind energy project site. No single method can adequately assess the spatial and temporal variation in nocturnal bird populations or the potential collision risk. Following nocturnal study methods in Kunz et al. (2007) is recommended to determine relative abundance, flight direction and flight altitude for assessing risk to migrating birds if warranted. If areas of interest are within the range of nocturnal species of concern (for example, marbled murrelet, northern spotted owl, Hawaiian petrel, Newell's shearwater), surveyors should use species-specific protocols recommended by state wildlife agencies, tribes or USFWS to assess the species' potential presence in the area of interest.

In contrast to the diurnal avian survey techniques previously described, considerable variation and uncertainty exist on the optimal protocols for using acoustic monitoring devices, radar, and other techniques to evaluate species composition, relative abundance, flight height, and trajectory of nocturnal migrating birds. While an active area of research, the use of radar for determining passage rates, flight heights and flight directions of nocturnal migrating animals has yet to be shown as a good indicator of

collision risk. Pre- and post-construction studies comparing radar monitoring results to estimates of bird and bat fatalities will be required to evaluate radar as a tool for predicting collision risk. Additional studies are also needed before making recommendations on the number of nights per season or the number of hours per night that are appropriate for radar studies of nocturnal bird migration (Mabee et al., 2006).

Bat Survey Methods

It is recommended that all techniques discussed below be conducted by biologists trained in bat identification, equipment use, and the analysis and interpretation of data resulting from the design and conduct of the studies. Activities that involve capturing and handling bats may require permits from state and/or federal agencies.

Acoustic Monitoring

Acoustic monitoring provides information about bat presence and activity, as well as seasonal changes in species occurrence and use, but does not measure the number of individual bats or population density. The goal of acoustic monitoring is to provide a prediction of the potential risk of bat fatalities resulting from the construction and operation of a wind facility. Our current state of knowledge about bat-wind turbine interactions, however, does not allow a quantitative link between pre-construction acoustic assessments of bat activity and operations fatalities. Discussions with experts, state wildlife trustee agencies, tribes, and USFWS will be needed to determine whether acoustic monitoring is warranted at a proposed wind energy site.

The predominance of bat fatalities detected to date are migratory species and acoustic monitoring should adequately cover periods of migration and periods of known high activity for other (i.e., non-migratory) species. Monitoring for a full year is recommended in areas where there is year round bat activity. Data on environmental variables such as temperature and wind speed should be collected concurrently with acoustic monitoring so these weather data can be used in the analysis of bat activity levels.

The number and distribution of sampling stations necessary to adequately estimate bat activity has not been well established but will depend, at least in part, on the size of the project area, variability within the project area, and a Tier 2 assessment of potential bat occurrence.

 The number of detectors needed to achieve the desired level of precision will vary depending on the within-site variation (e.g., Arnett et al. 2006, Weller 2007, E.B. Arnett, Bat Conservation International, unpublished data). We recommend placing acoustic detectors on existing meteorological towers, and these be placed approximately every two kilometers across the site where turbines are expected to be sited. Acoustic detectors should be placed at high positions (as high as practicable, based on tower height) on each meteorological tower included in the sample to record bat activity at or

near the rotor swept zone, the area of presumed greatest risk for bats. Developers should evaluate whether it would be cost effective to install detectors when meteorological towers are first established on a site. Doing so might reduce the cost of installation later and might alleviate time delays to conduct such studies.

If sampling at MET towers does not adequately cover the study area or provide sufficient replication, we recommend that additional sampling stations be established at low positions (~1.5-2 m) at a sample of existing MET towers and one or more mobile units (i.e., units that are moved to different locations throughout the study period) to increase coverage of the proposed project area. When practical, we recommend some acoustic monitoring of features identified as potentially high bat use areas within the study area (e.g., bat roosts and caves) to determine use of such features..

 There is growing interest in determining whether "low" position samples (~1.5-2 m) can provide equal or greater correlation with bat fatalities than "high" position samples (described above) because this would substantially lower cost of this work. Developers could then install a greater number of detectors at lower cost resulting in improved estimates of bat activity and, potentially, improved qualitative estimates of risk to bats. This is a research question that is not expected to be addressed at a project.

1656 Other Bat Survey Techniques

Occasionally, other techniques may be needed to answer Tier 3 questions and complement the information from acoustic surveys. Kunz et al. (2007), NAS (2007), Kunz and Parsons (2009) provide comprehensive descriptions of bat survey techniques, including those identified below that are relevant for Tier 3 studies at wind energy facilities.

Roost Searches and Exit Counts

Pre-construction survey efforts may be recommended to determine whether known or likely bat roosts in mines, caves, bridges, buildings, or other potential roost sites occur within the project vicinity, and to confirm whether known or likely unless bat roosts are present and whether they are occupied by bats. If active roosts are detected, it may be recommended that questions about colony size and species composition of roosts be answered. Exit counts and roost searches are two approaches to answering these questions, and Rainey (1995), Kunz and Parsons (2009), and Sherwin et al. (2009) are resources that describe options and approaches for these techniques. Roost searches should be performed cautiously because roosting bats are sensitive to human disturbance (Kunz et al. 1996). Known maternity and hibernation roosts should not be entered or otherwise disturbed unless authorized by state and/or federal wildlife agencies. Exit surveys at known roosts generally should be limited to non-invasive observation using low-light binoculars and infrared video cameras. Internal searches of abandoned mines or caves can be dangerous and should only be conducted by trained

researchers. For mine survey protocol and guidelines for protection of bat roosts, see the appendices in Pierson et al. (1999).

Multiple surveys will be required to determine presence or absence of bats in caves and mines, and the number of surveys needed will vary by species of bats, species and sex (maternity or bachelor colony) of bats, seasonality of use, and type of roost structure (e.g., caves or mines). For example, Sherwin et al. (2003) demonstrated that a minimum of three surveys are needed to determine absence of large hibernating colonies of Townsend's big-eared bats (Corynorhinus townsendii) in mines (90% probability), while a minimum of nine surveys (during a single warm season) are necessary before a mine could be eliminated as a bachelor roost for this species (90% probability). An average of three surveys was needed before surveyed caves could be eliminated as bachelor roosts (90% probability). It is recommended that decisions on level of effort follow discussion with relevant agencies and bat experts.

Activity Patterns

If active roosts are detected, it may be necessary to answer questions about behavior, movement patterns, and patterns of roost use for bat species of concern, or to further investigate habitat features that might attract bats and pose fatality risk. For some bat species, typically threatened, endangered, or state-listed species, radio telemetry or radar may be recommended to assess both the direction of movement as bats leave roosts, and the bats' use of the area being considered for development. Kunz et al. (2007) describe the use of telemetry, radar and other tools to evaluate use of roosts, activity patterns, and flight direction from roosts.

Mist-Netting for Bats

While mist-netting bats is required in some situations by state agencies, tribes, and the USFWS to determine the presence of threatened, endangered or other bat species of concern, mist-netting is not generally recommended as a common method for determining use of a site or assessing risk of wind development to bats for the following reasons: 1) not all proposed or operational wind energy facilities offer conditions conducive to capturing bats, and often the number of suitable sampling points is minimal or not closely associated with the project location; 2) capture efforts often occur at water sources offsite or at nearby roosts and the results may not reflect species presence or use on the site where turbines are to be erected; and 3) mist-netting isn't feasible at the heights of the rotor-swept zone, and captures below that zone may not adequately reflect risk of fatality. If mist-netting is employed, it is best used in combination with acoustic monitoring to inventory the species of bats present at a site.

Other Wildlife

While the above guidance emphasizes the evaluation of potential impacts to birds and bats, Tier 1 and 2 evaluations may identify other species of concern. Developers are

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species are primarily derived from potential habitat loss or displacement. The general guidance on the study design and methods for estimation of the distribution, relative abundance, and habitat use for birds is applicable to the study of other wildlife. Nevertheless, most methods and metrics will be species-specific and developers are advised to work with the state, tribal, or federal agencies, or other credible experts, as appropriate, during problem formulation for Tier 3.

encouraged to assess adverse impacts potentially caused by development for those

species most likely to be negatively affected by such development. Impacts to other

4. What are the potential risks of adverse impacts of the proposed wind energy project to individuals and local populations and their habitats? (In the case of rare or endangered species, what are the possible impacts to entire species and their habitats?)

Methods used for estimating risk will vary with the species of concern. For example, estimating potential bird fatalities in Tier 3 may be accomplished by comparing exposure estimates (described earlier in estimates of bird use) at the proposed site with exposure estimates and fatalities at existing projects with similar characteristics (e.g., similar technology, landscape, and weather conditions). If models are used, they may provide an additional tool for estimating fatalities, and have been used in Australia (Organ and Meredith 2004), Europe (Chamberlin et al. 2006), and the U.S. (Madders and Whitfield 2006). As with other prediction tools, model predictions should be evaluated and compared with post-construction fatality data to validate the models. Models should be used as a subcomponent of a risk assessment based on the best available empirical data. A statistical model based on the relationship of pre-construction estimates of raptor abundance and post-construction raptor fatalities is described in Strickland et al. 2009 (In review) and promises to be a useful tool for risk assessment.

Collision risk to individual birds and bats at a particular wind energy facility may be the result of complex interactions among species distribution, relative abundance, behavior, weather conditions (e.g., wind, temperature) and site characteristics. Collision risk for an individual may be low regardless of abundance if its behavior does not place it within the rotor-swept zone. If individuals (e.g. ravens) frequently occupy the rotor-swept zone but effectively avoid collisions, then they are also at low risk of collision with a turbine. Alternatively, if the behavior of individuals frequently places them in the rotor-swept zone, and they do not actively avoid turbine blade strikes, then they are at higher risk of collisions with turbines regardless of abundance. For a given species (e.g., red-tailed hawk), increased abundance increases the likelihood that individuals will be killed by turbine strikes, although the risk to individuals will remain about the same. The risk to a population increases as the proportion of individuals in the population at risk to collision increases.

At some wind energy facilities, bat fatalities are higher than bird fatalities, but the exposure risk of bats at these facilities is not fully understood (National Research Council (NRC) 2007). The issue is further complicated by the fact that bats may be attracted to turbines (Horn et

al. 2008, Cryan 2008). Research is required to determine whether this increased individual risk translates into higher population-level risk for bats.

The estimation of displacement risk (see below) requires an understanding of animal behavior in response to a wind energy project and its infrastructure, and a pre-construction estimate of presence/absence of species whose behavior would cause them to avoid areas in proximity to turbines, roads and other components of the project. The amount of habitat that is lost to indirect impacts will be a function of the sensitivity of individuals to the project and to the activity levels associated with the project's operations. The population-level significance of this habitat loss will depend on the amount of habitat available to the affected population. If the loss of habitat results in habitat fragmentation, then the risk to the demographic and genetic viability of the isolated animals is increased. Quantifying cause and effect may be very difficult, however.

5. If <u>adverse</u> impacts are predicted to species of concern, can these impacts be mitigated?

Results of Tier 3 studies provide a basis for identifying measures to mitigate those <u>adverse</u> impacts. Information on wildlife use of the proposed area is most useful when designing a project to avoid or minimize <u>adverse</u> impacts.

The extent of the impact of wind energy development on prairie grouse and sage grouse leking activity (e.g., social structure, mating success, persistence, etc.) and the associated impacts on productivity (e.g., nesting, nest success, chick survival, etc.) is poorly understood (Arnett et al. 2007, NRC 2007, Manville 2005). However, recent research documents that anthropogenic features (e.g., tall structures, buildings, roads, transmission lines, etc.) can adversely impact vital rates (e.g., nesting, nest success, leking behavior, etc.) of lesser prairie-chickens (Pruett et al. 2009, Pitman et al. 2005, Hagen et al. 2009) and greater prairie-chickens (Robel, *Pers. Comm.*) over long distances. Development within 1 to 1 ½ miles of active leks of prairie grouse may have significant adverse impacts on the affected grouse population and the inclusion of mitigation to offset those impacts is recommended.

Sage grouse are more sensitive to some forms of anthropogenic activity than are prairie grouse (Connelly et al. 2000). Based primarily on data documenting reduced fecundity (a combination of nesting, clutch size, nest success, juvenile survival, and other factors) in sage grouse populations near roads, transmissions lines, and areas of oil and gas development/production (Holloran 2005, Connelly et al. 2000), development within 3 to 5 miles (or more) of active sage grouse leks may have significant adverse impacts on the affected grouse population and mitigation efforts to offset those impacts is recommended. The magnitudes and proximal causes (e.g., noise, height of structures, movement, human activity, etc.) of those impacts on vital rates in grouse populations are areas of much needed research (Becker et al. 2009). Data accumulated through such research may improve our

understanding of the buffer distances that are necessary to avoid or minimize adverse

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impacts to prairie grouse and sage grouse populations.

When significant adverse ecological impacts cannot be fully avoided or adequately minimized, some form of compensatory mitigation may be appropriate to address the loss of habitat value. For example, it may be possible to mitigate habitat loss or degradation for a species of concern by enhancing or restoring nearby habitat value comparable to that potentially influenced by the wind energy project. More detail is provided on this topic in Chapter Four.

6. Are there studies that should be initiated at this stage that would be continued in either Tier 4 or Tier 5?

During Tier 3 problem formulation it is necessary to identify the studies needed to address the Tier 3 questions. Consideration of how the resulting data may be used in conjunction with post-constriction Tier 4 and 5 studies is also recommended. The design of post-construction impact or mitigation assessment studies will depend on the specific impact questions being addressed. Tier 3 predictions of fatalities will be evaluated using data from Tier 4 studies designed to estimate fatalities. Tier 3 studies may demonstrate the need for compensatory mitigation of significant adverse habitat impacts or for measures to avoid or minimize fatalities. Where habitat impacts are of major concern, Tier 5 studies will provide data that evaluate the predicted impacts and the effectiveness of avoidance, minimization, and mitigation measures. Evaluation of the impact of a wind energy project on demographic parameters of local populations, habitat use, or some other parameter(s), typically will require data on these parameters prior to and after construction of the wind energy facility.

Tier 3 Decision Point

At the end of Tier 3 the developer, and potentially the permitting authority, will make a decision regarding whether and how to develop the project. The decision point at the end of Tier 3 involves three potential outcomes:

- 1. Development of the site has a high probability of acceptable environmental impact based on existing and new information:
- There is little uncertainty regarding when and how development should proceed, and adequate information exists to satisfy any required permitting. The decision process proceeds to permitting, when required, and/or development, and pre-construction surveys are terminated.
- Development of the site has a relatively high probability of unacceptable impacts
 without proper measures being taken to mitigate those impacts. This outcome may be
 subdivided into two possible scenarios:
 - a. There is certainty regarding how to develop the site to adequately mitigate impacts. A decision to develop the site is made, conditional on the proper mitigation measures being adopted, with appropriate follow-up fatality studies (Tier 4) and habitat studies if necessary (Tier 5).

- b. There is uncertainty regarding how to develop the site to adequately mitigate impacts, or a permitting process requires additional information on potential wildlife impacts before permitting future phases of the project. A decision to develop the site is made conditional on the proper mitigation measures being taken and with appropriate follow up post-construction studies (Tier 4 and 5).
- 3. Development of the site has a high probability of unacceptable environmental impact that cannot be satisfactorily mitigated:
- Site development is delayed until plans can be developed that satisfactorily avoid, 1849 1850 minimize or provide compensatory mitigation for the impacts. Alternatively, the site is 1851 abandoned in favor of known sites with less potential for environmental impact, or the 1852 developer begins an evaluation of other sites or landscapes for more acceptable sites to 1853 develop.

D. Site Construction: Site Development and Construction Best Management Practices

During site planning and development, careful attention to reducing risk of adverse impacts to species of concern from wind energy facilities, through careful site selection and facility design, is recommended. The following best management practices (BMPs) can assist a developer in the planning process to reduce potential impacts to species of concern. Use of these BMPs should ensure that the potentially adverse impacts to most species of concern and their habitats present at many wind development sites would be reduced, although compensatory mitigation may be appropriate at a project level to address significant site-specific concerns and pre-construction study results.

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These BMPs will evolve over time as additional experience, learning, monitoring and research becomes available on how to best minimize wildlife and habitat impacts from wind energy projects. USFWS will work with the industry, stakeholders and the states to evaluate, revise and update these BMPs on a periodic basis, and the USFWS will maintain a readily available publication of recommended, generally accepted best practices.

- 1. Minimize, to the extent practicable, the area disturbed by pre-construction site monitoring and testing activities and installations.
- 1873 2. Avoid locating wind energy facilities in areas identified as having a demonstrated and unmitigatable high risk to birds and bats.
 - 3. Use available data from state and federal agencies, and other sources (which could include maps or databases), that show the location of sensitive resources and the results of Tier 2 and/or 3 studies to establish the layout of roads, power lines, fences, and other infrastructure.
 - 4. Use native species when seeding or planting during restoration.

5. To reduce avian collisions, place low and medium voltage connecting power lines associated with the wind energy development underground to the extent possible, unless burial of the lines is prohibitively expensive (i.e., where shallow bedrock exists) or where greater adverse impacts to biological resources would result.

- a. Overhead lines may be acceptable if sited away from high bird crossing locations, to the extent practicable, such as between roosting and feeding areas or between lakes, rivers, prairie grouse and sage grouse leks, and nesting habitats. To the extent practicable, they should be marked in accordance with Avian Power Line Interaction Committee (APLIC) collision guidelines.
- b. Overhead lines may be used when they parallel tree lines, employ bird flight diverters, or are otherwise screened so that collision risk is reduced.
- c. Above-ground low and medium voltage lines, transformers and conductors should follow the 2006 or most recent APLIC "Suggested Practices for Avian Protection on Power Lines."

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- 6. Avoid guyed communication towers and permanent meteorological towers at wind energy project sites. If guy wires are necessary, bird flight diverters or high visibility marking devices should be used.
- 1897 7. Use construction and management practices to minimize activities that may attract prey and predators to the wind energy facility.
- 8. Employ only red, or dual red and white strobe, strobe-like, or flashing lights, not steady burning lights to meet FAA requirements for visibility lighting of wind turbines, permanent met towers, and communication towers. Only a portion of the turbines within the wind project should be lighted, and all pilot warning lights should fire synchronously.
- 9. Keep lighting at both operation and maintenance facilities and substations located within half a mile of the turbines to the minimum required.
 - a. Use lights with motion or heat sensors and switches to keep lights off when not required.
 - b. Lights should be hooded downward and directed to minimize horizontal and skyward illumination.
 - c. Minimize use of high-intensity lighting, steady-burning, or bright lights such as sodium vapor, quartz, halogen, or other bright spotlights.
 - 10. Establish non-disturbance buffer zones to protect sensitive habitats or areas of high risk for species of concern identified in pre-construction studies. Determine the extent of the buffer zone in consultation with USFWS and state, local and tribal wildlife biologists, and land management agencies (e.g., BLM and USFS), or other credible experts as appropriate.
- 1917 11. Locate turbines to avoid separating birds and bats of concern from their daily roosting,
 1918 feeding, or nesting sites if documented that the turbines' presence poses a risk to
 1919 species.
- 1920 12. Avoid impacts to hydrology and stream morphology, especially where federal or state-1921 listed aquatic or riparian species may be involved.
- 13. Although it is unclear whether tubular or lattice towers reduce risk of collision, when 1923 practical use tubular towers or best available technology to reduce ability of birds to 1924 perch and to reduce risk of collision.
- 1925 14. Minimize the number and length of access roads, use existing roads when feasible.
- 15. Minimize impacts to wetlands and water resources by following all applicable provisions
 of the Clean Water Act (CWA) (33 USC 1251-1387) and the Rivers and Harbors Act (33 USC 301 et seq.), for instance by developing and implementing a stormwater management
 plan and taking measures to reduce erosion.

- 16. Reduce vehicle collision risk to wildlife by instructing project personnel to drive at
 appropriate speeds, be alert for wildlife, and use additional caution in low visibility
 conditions.
- 1933 17. Instruct employees, contractors, and site visitors to avoid harassing or disturbing wildlife, particularly during reproductive seasons.
- 18. Reduce fire hazard from vehicles and human activities. (Instruct employees to use spark
 1936 arrestors on power equipment, ensure that no metal parts are dragging from vehicles,
 1937 use caution with open flame, cigarettes, etc.)
- 1938 19. Follow federal and state measures for handling toxic substances to minimize danger to water and wildlife resources from spills.
- 1940 20. Reduce the introduction and spread of invasive species by following applicable local
 1941 policies for noxious weed control, cleaning vehicles and equipment arriving from areas
 1942 with known invasive species issues, using locally sourced topsoil, and monitoring for and
 1943 rapidly removing noxious weeds at least annually.
- 1944 21. Utilize pest and weed control measures as specified by county or state requirements, or
 1945 by applicable federal agency requirements (such as Integrated Pest Management) when
 1946 federal policies apply.

Comment [ejk3]: Additional detail for this section will be provided and discussed at the next FAC meeting.

E. Tier 4: Post-Construction Fatality Studies

Following the tiered decision process, the outcome of Tier 1 to 3 studies will determine the need for Tier 4 studies.

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Tier 4 studies focus specifically on post-construction fatality monitoring. Activities involve searching for bird and bat carcasses beneath turbines to estimate the number and species composition of fatalities. This information may be useful in answering other questions such as relationships with site characteristics, comparison of fatalities among facilities, comparison of actual and predicted fatality rates estimated in previous tiers.

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Fatality studies should be considered for all projects. Fatality studies should occur over all seasons of occupancy for the species being monitored, based on information produced in previous tiers. The number of seasons and total length of the study should be determined separately for bats and birds. It may be appropriate to conduct studies for different lengths of time depending on the species of concern. For example, if raptors occupy an area year-round, it may be appropriate to monitor for raptors throughout the year (12 months) and only monitor for bats when they are active (spring, summer and fall or approximately eight months). All fatality studies should include estimates of carcass removal and carcass detection bias likely to influence those rates.

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1966 Tier 4 Questions

Post-construction fatality monitoring activities are designed to answer the following questions as appropriate for the individual project.

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- 1. What is the bird and bat fatality rate for the project?
- 1971 2. What are the fatality rates of species of concern?
- 1972 3. How do the estimated fatality rates compare to the predicted fatality rates?
- 1973 4. Do bird and bat fatalities vary within the project site in relation to site characteristics?
- 1974 5. How do the fatality rates compare to the fatality rates from existing projects in similar1975 landscapes with similar species composition and use?
- 6. What is the composition of fatalities in relation to migrating and resident birds and bats at the site?
- 7. Do fatality data suggest the need for mitigation measures to reduce risk?

Fatality monitoring results should be of sufficient statistical validity to answer Tier 4

Fatality monitoring results should be of sufficient statistical validity to answer Tier 4 questions, to allow comparisons with pre-construction impact predictions and comparisons

1982 with other sites, and to provide a basis for determining if corrective management or

1983 mitigation measures at the site are appropriate.

Comment [ejk4]: The Synthesis Workgroup has not fully agreed on this question, and it requires discussion by the FAC (see page 52).

1984 Tier 4 Protocol Design Issues

The basic method of measuring fatality rates is the carcass search. Search protocols should be standardized to the greatest extent possible, especially for common objectives and species of concern, and they should include methods for adequately accounting for sampling biases (searcher efficiency and scavenger removal). However, some situations warrant exceptions to standardized protocol, and the responsibility of demonstrating that an exception is appropriate and applicable should be on the stakeholder attempting to justify increasing or decreasing the duration or intensity of operations monitoring.

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Some general guidance is given below with regard to the following fatality search protocol design issues:

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- Duration and frequency of monitoring
- Number of turbines to monitor
 - Delineation of carcass search plots, transects, and habitat mapping
- General search protocol
- Field bias and error assessment
- Estimators of fatality

More detailed descriptions and methods of fatality search protocols and can be found in the California (California Energy Commission 2007) and Pennsylvania (PGC 2007) state guidelines and in Kunz et al. (2007) and Smallwood (2007).

Frequency of carcass searches

Frequency of carcass searches (search interval) may vary for birds and bats, and will vary depending on the questions to be answered, the species of concern, and their seasonal abundance at the project site. The carcass searching protocol should be adequate to answer applicable Tier 4 questions at an appropriate level of precision to make general conclusions about the project, and are not intended to provide highly precise measurements of fatalities. Except during low use times (e.g. winter months in northern states), it is recommended that protocols be designed such that carcass searches occur at some turbines within the project area most days each week of the study.

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The search interval is the interval between carcass searches at individual turbines, and this interval may be lengthened or shortened depending on the carcass removal rates. If the primary focus is on fatalities of large raptors, where carcass removal is typically low, then a longer interval between searches (e.g., 14-28 days) is sufficient. However, if the focus is on fatalities of bats and small birds and carcass removal is high, then a shorter search interval will be necessary.

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There are situations in which studies of higher intensity (e.g., daily searches at individual turbines within the sample) may be appropriate. These would be considered only in Tier

5 studies or in research programs because the greater complexity and level of effort goes beyond that recommended for typical Tier 4 post construction monitoring. Tier 5 and research studies could include evaluation of specific measures that have been implemented to mitigate potential <u>adverse</u> impacts to species of concern identified during pre-construction studies.

Number of turbines to monitor

If available, data on variability among turbines from existing projects in similar conditions within the same region is recommended as a basis for determining needed sample size (see Morrison et al., 2008). If data are not available, it is recommended that a sufficient number of turbines be selected via a systematic sample with a random start point. Sampling plans can be varied (e.g., rotating panels [McDonald 2003, Fuller 1999, Breidt and Fuller 1999, and Urquhart et al. 1998]) to increase efficiency as long as a probability sampling approach is used. If the project contains fewer than 10 turbines, it is recommended that all turbines in the area of interest be searched unless otherwise agreed to by the permitting or wildlife resource agencies. When selecting turbines, it is recommended that a systematic sample with a random start be used when selecting search plots to ensure interspersion among turbines. Stratification among different habitat types also is recommended to account for differences in fatality rates among different habitats (e.g., grass versus cropland or forest); a sufficient number of turbines should be sampled in each strata.

Delineation of carcass search plots, transects, and habitat mapping

Evidence suggests that greater than 80% of bat fatalities fall within half the maximum distance of turbine height to ground (Erickson 2003 a, b), and a minimum plot width of 120 m from the turbine should be established at sample turbines. Plots will need to be larger for birds, with a width twice the turbine height to ground. Decisions regarding search plot size should be made in discussions with the USFWS, state wildlife agency, permitting agency and tribes. It may be useful to consult other scientifically credible information sources.

It is recommended that each search plot should be divided into oblong subplots or belt transects and that each subplot be searched. The objective is to find as many carcasses as possible so the width of the belt will vary depending on the ground cover and its influence on carcass visibility. In most situations a search width of 6 meters should be adequate, but this may vary from 3-10 meters depending on ground cover.

Searchable area within the theoretical maximum plot size varies, and heavily vegetated areas (e.g., eastern mountains) often do not allow surveys to consistently extend to the maximum plot width. In other cases it may be preferable to search a portion of the maximum plot instead of the entire plot. For example, in some landscapes it may be impractical to search the entire plot because of the time required to do an effective search, even if it is accessible (e.g., croplands), and data from a probability sample of

subplots within the maximum plot size can provide a reasonable estimate of fatalities. It is important to accurately delineate and map the area searched for each turbine to adjust fatality estimates based on the actual area searched. It may be advisable to establish habitat visibility classes in each plot to account for differential detectability, and to develop visibility classes for different landscapes (e.g., rocks, vegetation) within each search plot. For example, the Pennsylvania Game Commission (2007) identified four classes based on the percentage of bare ground.

The use of visibility classes requires that detection and removal biases be estimated for each class. Fatality estimates should be made for each class and summed for the total area sampled. Global positioning systems (GPS) are useful for accurately mapping the actual total area searched and area searched in each habitat visibility class, which can be used to adjust fatality estimates. The width of the belt or subplot searched may vary depending on the habitat and species of concern; the key is to determine actual searched area and area searched in each visibility class regardless of transect width. An adjustment may also be needed to take into account the density of fatalities as a function of the width of the search plot.

General search protocol guidance

Personnel trained in proper search techniques should look for bird and bat carcasses along transects or subplots within each plot and record and collect all carcasses located in the searchable areas. A complete search of the area should be accomplished and subplot size (e.g., transect width) should be adjusted to compensate for detectability differences in the search area. Subplots should be smaller when vegetation makes it difficult to detect carcasses; subplots can be wider in open terrain. Subplot width also can vary depending on the size of the species being looked for. For example, small species such as bats may require smaller subplots than larger species such as raptors.

Data to be recorded include date, start time, end time, observer, which turbine area was searched (including GPS coordinates) and weather data for each search. When a dead bat or bird is found, the searcher should place a flag near the carcass and continue the search. After searching the entire plot, the searcher returns to each carcass and records information on a fatality data sheet, including date, species, sex and age (when possible), observer name, turbine number, distance from turbine, azimuth from turbine (including GPS coordinates), habitat surrounding carcass, condition of carcass (entire, partial, scavenged), a digital photograph of the carcass should be taken), and estimated time of death (e.g., ≤1 day, 2 days). Rubber gloves should be used to handle all carcasses to eliminate possible transmission of rabies of other diseases and to reduce possible human scent bias for carcasses later used in scavenger removal trials. Carcasses should be placed in a plastic bag and labeled. Fresh carcasses (those determined to have been killed the night immediately before a search) should be redistributed at random points on the same day for scavenging trials.

Field Bias and Error Assessment

It has long been recognized that during searches conducted at wind turbines, actual fatalities are incompletely observed and that therefore carcass counts must be adjusted by some factor that accounts for imperfect detectability. Important sources of bias and error include: 1) fatalities that occur on a highly periodic basis; 2) carcass removal by scavengers; 3) differences in searcher efficiency; 4) failure to account for the influence of site (e.g. vegetation) conditions in relation to carcass removal and searcher efficiency; and 5) fatalities or injured bats that may land or move outside search plots.

Some fatalities may occur on a highly periodic basis creating a potential sampling error (number 1 above). It is recommended that sampling be scheduled so that some turbines are searched most days so that episodic events are more likely detected, regardless of the search interval. To address bias sources 2-4 above, it is strongly recommended that all fatality studies conduct carcass removal and searcher efficiency trials using accepted methods (Anderson 1999, Kunz et al. 2007, Arnett et al. 2007, NRC 2007). Bias trials should be conducted throughout the entire study period and searchers should be unaware of which turbines are to be used or the number of carcasses placed beneath those turbines during trials. Carcasses or injured individuals may land or move outside the search plots (number 5 above). With respect to Tier 4 fatality estimates, this potential sampling error is considered to be small and can be ignored.

Prior to a study's inception, a list of random turbine numbers and random azimuths and distances (in meters) from turbines should be generated for placement of each bat or bird used in bias trials. Data recorded for each trial carcass prior to placement should include date of placement, species, turbine number, distance and direction from turbine, and visibility class surrounding the carcass. Trial carcasses should be distributed as equally as possible among the different visibility classes throughout the study period and study area. Studies should attempt to avoid "over-seeding" any one turbine with carcasses by placing no more than one or two carcasses at any one time at a given turbine. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction, and its location should be recorded. There is no agreed upon sample size for bias trials, though some state guidelines recommend from 50 - 200 carcasses.

Estimators of Fatality

If there were a direct relationship between the number of carcasses observed and the number that were killed, there would be no need to develop a complex estimator that adjusts observed counts for detectability, and observed counts could be used as a simple index of fatality. But the relationship is not direct and raw carcass counts recorded using different search intervals and under different carcass removal rates and searcher efficiency rates are not directly comparable. It is strongly recommended that only the most contemporary equations for estimating fatality be used, as some original versions are now known to be extremely biased under many commonly encountered field conditions.

Tier 4 Methods and Metrics

In addition to the monitoring protocol, the metrics used to estimate fatality rates must be selected with the Tier 4 questions and objectives in mind. Metrics considerations for each of the Tier 4 questions are discussed briefly below. Not all questions will be relevant for each project, and which questions apply would depend on Tier 3 outcomes.

1. What is the bird and bat fatality rate for the project?

The primary objective of fatality searches is to determine the overall estimated fatality rate for birds and bats for the project. These rates serve as the fundamental basis for all comparisons of fatalities, and if studies are designed appropriately they allow researchers to relate fatalities to site characteristics and environmental variables, and to evaluate mitigation measures. Several metrics are available for expressing fatality rates. Early studies reported fatality rates per turbine, however this metric is somewhat misleading as turbine sizes and their risks to birds vary significantly (NRC 2007). Fatalities are frequently reported per nameplate capacity (i.e. MW), a metric that is easily calculated and better for comparing fatality rates among different sized turbines. Even with turbines of the same name plate capacity, the size of the rotor swept area may vary among manufacturers, and turbines at various sites may operate for different lengths of time and during different times of the day and seasons. With these considerations in mind, it is recommended that fatality rates be expressed on a per turbine and per nameplate MW basis until a better metric becomes available.

2. What are the fatality rates of species of concern?

This analysis simply involves calculating fatalities per turbine of all species of concern at a site when sample sizes are sufficient to do so. These fatalities should be expressed on a per nameplate MW basis if comparing species fatality rates among projects.

3. How do the estimated fatality rates compare to the predicted fatality rates?

There are a several ways that predictions can be assigned and later evaluated with actual fatality data. During the planning stages in Tier 2, predicted fatalities may be based on existing data at similar facilities in similar landscapes used by similar species. In this case, the assumption is that use is similar, and therefore that fatalities may be similar at the proposed facility. Alternatively, metrics derived from pre-construction assessments for an individual species or group of species – usually an index of activity or abundance at a proposed project – could be used in conjunction with use and fatality estimates from existing projects to develop a model for predicting fatalities at the proposed project site. Finally, physical models can be used to predict the probability of a bird of a particular size striking a turbine, and this probability, in conjunction with estimates of use and avoidance behavior, can be used to predict fatalities.

The most current equations for estimating fatality should be used to evaluate fatality predictions. Several statistical methods can be found in the revised Strickland et al. 2009 (In review) and used to evaluate fatality predictions. Metrics derived from Tier 3 preconstruction assessments may be correlated with fatality rates, and (using the project as the experimental unit), in Tier 5 studies it should be possible to determine if different preconstruction metrics can in fact accurately predict fatalities and, thus, risk.

4. How do the fatality rates compare to the fatality rates from existing facilities in similar landscapes with similar species composition and use?

Comparing fatality rates among facilities with similar characteristics is useful to determine patterns and broader landscape relationships, as is discussed in some detail above for predicting fatalities at a proposed project site. Fatality rates should be expressed on a per nameplate MW or some other standardized metric basis for comparison with other projects, and may be correlated with site characteristics – such as proximity to wetlands, riparian corridors, mountain-foothill interface, or other broader landscape features – using regression analysis. Comparing fatality rates from one project to fatality rates of other projects provides insight into whether a project has relatively high, moderate or low fatalities.

5. Do bird and bat fatalities vary within the project site in relation to site characteristics?

Turbine-specific fatality rates may be related to site characteristics such as proximity to water, forest edge, staging and roosting sites, known stop-over sites, or other key resources, and this relationship may be estimated using regression analysis. This information is particularly useful for evaluating micro-siting options when planning a future facility or, on a broader scale, in determining the location of the entire project.

6. What is the composition of fatalities in relation to migrating and resident birds and bats at the site?

The simplest way to address this question is to separate fatalities per turbine of known resident species (e.g., big brown bat, prairie horned lark) and those known to migrate long distances (hoary bat, red-eyed vireo). These data are useful in determining patterns of

species composition of fatalities and possible mitigation measures directed at residents, migrants, or perhaps both, and can be used in the assessment of potential population effects.

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7. Do fatality data suggest the need for mitigation measures to reduce risk?

Comment [ejk5]: The Synthesis Workgroup has not reached agreement on this question, and it requires discussion by the FAC.

In some cases, the level of magnitude of fatalities may be needed for individual species to determine when significant adverse impacts to these species of concern have occurred at a project. This information can provide both wind developers and relevant agencies a common expectation for the need to address unacceptable fatality levels resulting from Tier 4 or Tier 5 studies through additional mitigation measures.

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Fatality levels should be species-specific, consider the regional factors affecting the species, and established through coordination between state fish and wildlife agencies and regional USFWS offices.

F. Tier 5: Other Post-construction Studies

Tier 5 studies will not be necessary for most projects. Tier 5 studies can be costly, complex and time consuming, and the Committee anticipates that the tiered approach will steer projects away from sites where Tier 5 studies would be necessary.

• When Tier 5 studies are conducted, they will be site-specific and intended to 1) evaluate the direct and indirect effects (e.g., displacement) of significant adverse habitat impacts, on species of concern; 2) analyze factors associated with impacts, particularly direct impacts, in those cases in which impacts significantly exceed preconstruction predictions; 3) identify additional actions as warranted when mitigation measures implemented for a project are not adequate; and 4) assess demographic effects on local populations of species of concern.

Tier 5 Questions

Tier 5 studies are intended to answer questions that fall in three major categories; answering yes to any of these questions might indicate a Tier 5 study is needed:

 Are post-construction impacts significantly higher than pre-construction estimates for direct and indirect impacts on species of concern and their habitat determined to be of interest in Tier 3?

For example, in the Tier 3 risk assessment, predictions of collision fatalities and habitat impacts (direct and indirect) are developed. Post-construction studies in Tiers 4 and 5 evaluate the accuracy of those predictions by estimating impacts. If post-construction studies demonstrate an unacceptably high level of adverse impact, Tier 5 studies may also be warranted. Such Tier 5 studies will be unusual and will not apply to most projects.

2. Have mitigation measures implemented (other than fee in lieu) as part of the project to avoid significant, adverse direct and indirect habitat and fatality impacts been ineffective, or significantly less effective than anticipated? If habitat restoration is conducted, it may be desirable to monitor the restoration efforts to determine if there is replacement of habitat conditions.

One objective of Tier 4 studies is to assess the effectiveness of fatality mitigation measures implemented as part of the project and to identify such alternative or additional measures as are necessary. If Tier 4 studies indicate that collision fatalities and adverse habitat impacts are unacceptably high, there may be additional or alternative mitigation measures which should be explored. The effectiveness of these additional measures would be evaluated using Tier 5 studies.

3. Are the estimated impacts of the proposed wind energy project likely to lead to population declines in the species of concern?

Impacts of a wind energy project will have population level effects if the project causes a population decline in the species of concern (lambda (λ) is significantly less than 1).

For non-listed species, this assessment will apply only to the local population. For listed species, the assessment may include impact assessments for the local or regional population, or the entire species.

Circumstances in which Tier 5 studies may be conducted include:

 Unacceptably high fatalities leading to studies assessing factors associated with those higher impacts and testing additional design and operation adjustments when project design modifications or operational activities fail to meet impact mitigation goals.

For example, if Tier 4 fatality studies document that a particular turbine or set of turbines exhibits unacceptably higher bird or bat collision fatality than predicted, adaptive management (as defined in Chapter 2B) may be useful in evaluating alternative mitigation measures to avoid or minimize future fatalities at that turbine/turbine string.

- 2) There is the potential for significant fatality impacts or significant adverse impacts to habitat for species of concern, there is a need to assess the impacts more closely, and there is uncertainty over how these impacts will be mitigated.
- 3) The rare occasion when fatality and/or significant adverse habitat impacts suggest the potential for a reduction in the viability of an affected population, in which case studies on the potential for population impacts may be warranted.
- 4) When a developer evaluates the effectiveness of a risk reduction measure before deciding to continue the measure permanently or whether to use the measure when implementing future phases of a project

In the event additional turbines are proposed as an expansion of an existing project, results from Tier 4 and Tier 5 studies and the decision-making framework contained in the tiered approach can be used to determine whether the project should be expanded and whether additional information should be collected. It may also be necessary to evaluate whether additional measures are warranted to reduce adverse impacts to species.

Tier 5 Study Design Issues

Because Tier 5 studies will be highly variable and unique to the circumstances of the individual project, these Guidelines do not provide specific guidance on all potential approaches, but make some general statements about study design. Specific Tier 5 study designs will depend on the types of questions, the specific project, and practical considerations. The most common practical considerations include the area being studied, the time period of interest, the species of concern, potentially confounding variables, time available to conduct studies, project budget, and the magnitude of the anticipated impacts.

In the context of wind energy development, when it is possible to collect data both pre- and post-construction in the areas of interest and reference areas are available, then the Before-After-Control-Impact (BACI) is the most statistically robust design. The BACI design is most like the classic manipulative experiment. In the absence of a suitable reference area the design is reduced to a Before-After (BA) analysis of effect, where the differences between pre- and post-construction parameters of interest are assumed to be the result of the wind facility, independent of other potential factors affecting the assessment area. With respect to BA studies, the key question is whether the observations taken immediately after the incident can reasonably be expected within the expected range for the system (Manly 2009). Reliable quantification of impact usually will include additional study components to limit variation and the confounding effects of natural factors that may change with time.

 In most situations the timeline for the development of a wind energy facility does not allow for the collection of pre-construction data and suitable reference areas are lacking. Furthermore, alterations in land use or disturbance over the course of a multi-year BACI or BA study may complicate the analysis of study results.

 When pre-construction data are unavailable and/or a suitable reference area is lacking, the reference Control Impact Design (Morrison et al. 2008) is the recommended design. The lack of a suitable reference area also can be addressed using the Impact Gradient Design, when habitat and species use are homogenous in the assessment area prior to development. When applied both pre and post-construction, the Impact Gradient Design is a suitable replacement for the classic BACI (Morrison et al. 2008).

In the study of habitat impacts, the resource selection function (RSF) study design (see Anderson et al 1999; Morrison et al. 2008; Manly et al. 2002) is a statistically robust design, either with or without pre-construction and reference data. Habitat selection is modeled as a function of characteristics measured on resource units and the use of those units by the animals of interest. The RSF allows the estimation of the probability of use as a function of

⁸ In this context, such designs are not true experiments in that the treatments (project development and control) are not randomly assigned to an experimental unit, and there is often no true replication. Such constraints are not fatal flaws, but do limit statistical inferences of the results.

- the distance to various environmental features, including wind energy facilities, and thus
- 2357 provides a direct quantification of the magnitude of the displacement effect. RSF could be
- 2358 improved with pre-construction and reference area data. Nevertheless, it is a relatively
- 2359 powerful approach to documenting displacement or the effect of mitigation measures
- 2360 designed to reduce displacement even without those additional data.
- 2361 Tier 5 Examples
- 2362 As described earlier, Tier 5 studies will not be conducted at most projects, and the specific
- 2363 Tier 5 questions and methods for addressing these questions will depend on the individual
- project and the concerns raised during pre-construction studies and during operational
- 2365 phases. Rather than provide specific guidance on all potential approaches, these Guidelines
- 2366 offer the following case studies as examples of studies that have attempted to answer Tier 5
- 2367 questions.

- 1. Habitat Impacts Displacement and Demographic Impact Studies
- 2369 Studies to assess impacts may include quantifying species' habitat loss (e.g., acres of lost
- 2370 grassland habitat for grassland songbirds) and habitat modification. For example an increase
- in edge may result in greater nest parasitism and nest predation. Assessing indirect impacts
- 2372 may include two important components: 1) indirect effects to wildlife resulting from
- 2373 displacement, due to disturbance, habitat fragmentation, loss, and alteration and 2)
- 2374 demographic effects that may occur at the local, regional or population-wide levels due to
- 2375 reduced nesting and breeding densities, increased isolation between habitat patches, and
- effects on behavior (e.g., stress, interruption, and modification). These factors can
- 2377 individually or cumulatively affect wildlife, although some species may be able to habituate
- 2378 to some or perhaps all habitat changes. Indirect impacts may be difficult to quantify but
- their effects may be significant (e.g., Stewart et al. 2007, Pearce-Higgins et al. 2008, Bright et
- 2380 al. 2008, Drewitt and Langston 2006, Robel et al. 2004, Pruett et al. 2009).

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- 2382 Example: In southwestern Pennsylvania, development of a wind energy facility is proceeding
- at a site located within the range of a state listed terrestrial species. Surveys were
- 2384 performed at habitat locations appropriate for use by the animal, including at control sites.
- 2385 Post-construction studies are planned at all locations to demonstrate any displacement
 - effects resulting from the construction and operation of the facility.

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- 2388 The Committee recognizes that displacement studies may not be appropriate for most
- 2389 individual projects. Consideration should be given to developing collaborative research
- 2390 efforts with industry, government agencies, and non-governmental organizations to
 - conduct studies to address displacement as discussed in Chapter 2D, above.

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- 2393 Displacement is considered a potentially significant adverse impact to species such as prairie
- 2394 grouse (prairie chickens, sharp-tailed grouse), and sage grouse, and displacement studies
- may be necessary to determine the extent of these impacts and the need for mitigation.

Displacement studies may use any of the study designs describe earlier. The most scientifically robust study designs to estimate displacement effects are before-after/control-impact (BACI), resource selection function (RSF), and impact gradient. RSF and impact gradient designs may not require specialized data gathering during Tier 3.

Telemetry studies that measure impacts of the project development on displacement, nesting, nest success, and survival of prairie grouse and sage grouse in different environments (e.g., tall grass, mixed grass, sandsage, sagebrush) will require spatial and temporal replication, undisturbed reference sites, large sample sizes covering large areas, and will be expensive. Examples of study designs and analyses used in the studies of other forms of energy development are presented in Holloran et al. (2005), Pitman et al. (2005), and Robel et al. (2004). Anderson et al. (1999) provides a thorough discussion of the design, implementation, and analysis of these kinds of field studies and should be consulted when designing the BACI study.

 Studies are being initiated to evaluate effects of wind energy development on greater sage-grouse in Wyoming. In addition to measuring demographic patterns, these studies will use the RSF study design (see Sawyer et al. 2006) to estimate the probability of sage-grouse use as a function of the distance to environmental features, including an existing and a proposed wind energy facility.

In certain situations, such as for a proposed wind energy project site that is relatively small and in a more or less homogeneous landscape, an impact gradient design may be an appropriate means to assess impacts of the wind energy facility on resident populations (Strickland et al., 2002). For example, Leddy et al. 1999 used the impact gradient design to evaluate grassland bird density as a function of the distance from wind turbines. Data were collected at various distances from turbines along transects.

This approach provides information on whether there is an effect, and may allow quantification of the gradient of the effect and the distance at which the effect no longer exists – the assumption being that the data collected at distances beyond the influence of turbines are the reference data (Erickson et al., 2007). An impact gradient analysis could also involve measuring the number of breeding grassland birds counted at point count plots as a function of distance from the wind turbines (Johnson et al. 2000).

2. Unacceptable levels of fatalities (beyond those predicted)

More intensive post-construction fatality studies may be used to determine relationships between fatalities and weather, wind speed or other covariates, which usually require daily carcass searches. Fatalities determined to have occurred the previous night can be correlated with that night's weather or turbine characteristics to establish important relationships that can then be used to evaluate the most effective times and conditions to implement operational modifications to reduce collision fatality at the facility.

3. Mitigation of Fatalities

2439 The efficacy of operational modifications (e.g. Changing turbine cut-in speed) of a wind facility to reduce collision fatalities have only recently been evaluated (Arnett et al. 2009, 2440 2441 Baerwald et al 2009). Operational modifications should be applied as mitigation only at sites where collision fatalities are predicted or demonstrated to be high. 2442

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Tier 5 Studies and Research

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2454 2455 The Committee recognizes that developers may be asked to conduct a study on an experimental mitigation technique, such as differences in turbine cut-in speed to reduce bat fatalities. Such techniques may show promise in mitigating the impacts of wind energy development to wildlife, but may have not been shown to have broad applicability for mitigation. Such techniques should not be routinely applied to wind energy projects, but application at appropriate sites will contribute to the breadth of knowledge regarding the efficacy of such measures in addressing collision fatalities. In addition, studies involving multiple sites and academic researchers can provide more robust research results, and such studies take more time and resources than are appropriately carried out by one developer at a single site. Examples below demonstrate collaborative research efforts to address displacement, operational modifications, and population level impacts.

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1. Displacement Studies

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Researchers at Kansas State University, as part of the NWCC Grassland Shrub Steppe Species Collaborative (GS₃C), have begun a multi-year telemetry study to evaluate effects of three proposed wind energy projects on displacement and demographic parameters (survival, nest success, brood success, fecundity) of greater prairie chickens (Tympanuchus cupido) in Kansas. Studies are intended to evaluate whether: 1) lek attendance is affected by wind energy development; 2) greater prairie-chickens avoid wind-towers and/or other anthropogenic features; and 3) wind energy development reduces nest success or chick survival.

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The study combines use of data collected at three proposed wind energy projects

in 2009.

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and reference areas, and the BACI design has been used to assess impacts on demographic parameters. Several hundred birds have been radio marked on all sites combined to obtain baseline data on both the reference areas and wind energy project sites. Birds are located frequently to determine home ranges and habitat use prior to wind energy developments so that displacement can be measured once the facilities are constructed. In addition, data are collected on survival of radio-marked birds as well as nest success, fledgling success, and fecundity (the number of female offspring produced per adult female). The first post-construction data was collected

2. Operational Modifications to Reduce Collision Fatality

Comment [eik6]: An additional example of a displacement study using an impact gradient design will be provided for review.

Comment [ejk7]: An additional example of using acoustic deterrents will be provided for review.

Arnett et al. (2009) conducted studies on the effectiveness of changing turbine cutin speed on reducing bat fatality at wind turbines at the Casselman Wind Project in Somerset County, Pennsylvania. Their objectives were to: 1) determine the difference in bat fatalities at turbines with different cut-in-speeds relative to fully operational turbines; and 2) determine the economic costs of the experiment and estimated costs for the entire area of interest under different curtailment prescriptions and timeframes. Arnett et al. (2009) reported substantial reductions in bat fatalities with relatively modest power losses.

In Kennedy County, Texas, investigators are refining and testing a real-time curtailment protocol. The projects use a MERLIN avian profiling radar system to detect approaching "flying vertebrates" (birds and bats), primarily during spring and fall bird and bat migrations. The blades automatically idle when risk reaches a certain level and weather conditions are particularly risky. Based on estimates of the number and timing of migrating raptors, feathering (real-time curtailment) experiments are underway in Tehuantepec, Mexico, where raptor migration through a mountain pass is extensive.

Other tools, such as thermal imaging (Horn et al. 2008) or acoustic detectors (Kunz et al. 2007), have been used to quantify post-construction bat activity in relation to weather and turbine characteristics for improving operational mitigation efforts. For example, at the Mountaineer project in 2003, Tier 4 studies (weekly searches at every turbine) demonstrated unanticipated and high levels of bat fatalities (Kerns and Kerlinger 2004). Daily searches were instituted in 2004 and revealed that fatalities were strongly associated with low-average-wind-speed nights, thus providing a basis for testing operational modifications (Arnett 2005, Arnett et al. 2008). The program also included behavioral observations using thermal imaging that demonstrated higher bat activity at lower wind speeds (Horn et al. 2008). These studies at Mountaineer and at a Pennsylvania site suggested that wind energy projects located on Mid-Atlantic ridge-top could reasonably be expected to experience significant bat fatalities (Arnett 2005). As a result, the Pennsylvania Game Commission has recommended more frequent carcass searches characteristic of Tier 5 studies (see PGC 2007).

3. Assessment of Population-level Impacts

The Altamont Pass Wind Resource Area (APWRA) has been the subject of intensive scrutiny because of avian fatalities, especially for raptors, in an area encompassing more than 5,000 wind turbines (e.g., Orloff and Flannery 1992; Smallwood and Thelander 2004, 2005). To assess population-level effects of long lived raptors, Hunt (2002) completed a four-year telemetry study of golden eagles at the APWRA and concluded that while the population is self-sustaining, fatalities resulting from windenergy production were of concern because the population apparently depends on floaters from the local population and/or immigration of eagles from other subpopulations to fill vacant territories. Hunt conducted follow-up surveys in 2005

2522 (Hunt and Hunt 2006) and determined that all 58 territories occupied by eagle pairs 2523 in 2000 were also occupied in 2005.

2524 G. Retrofitting, Repowering, and Decommissioning Phases As with project construction, these Guidelines offer best management practices (BMPs) for 2525 2526 the retrofitting, repowering, and decommissioning phases of wind energy projects. 2527 Retrofitting 2528 Retrofitting is defined as replacing portions of existing wind turbines or project facilities so that at least part of the original turbine, tower, electrical infrastructure or foundation is 2529 being utilized. Retrofitting BMPs include: 2530 1. Retrofitting of turbines should use installation techniques that minimize new site 2531 disturbance, soil erosion, and removal of vegetation of habitat value. 2532 2533 2. Retrofits should employ shielded, separated or insulated electrical conductors that minimize electrocution risk to avian wildlife per APLIC (2006). 2534 3. Retrofit designs should prevent nests or bird perches from being established in or on 2535 the wind turbine or tower. 2536 4. FAA visibility lighting of wind turbines should employ only red, or dual red and white 2537 2538 strobe, strobe-like, or flashing lights, not steady burning lights. 5. Keep lighting at both operation and maintenance facilities and substations located 2539 2540 within half a mile of the turbines to the minimum required. a. Use lights with motion or heat sensors and switches to keep lights off when 2541 not required. 2542 b. Lights should be hooded downward and directed to minimize horizontal and 2543 skyward illumination. 2544 c. Minimize use of high intensity lighting, steady-burning, or bright lights such as 2545 sodium vapor, quartz, halogen, or other bright spotlights. 2546 6. Remove wind turbines when they are no longer cost effective to retrofit. 2547 Repowering Existing Wind Projects 2548 Repowering may include removal and replacement of turbines and associated 2549 infrastructure. BMPs include: 2550 2551

- 1. To the greatest extent practicable, existing roads, disturbed areas and turbine strings should be re-used in repower layouts.
- 2. Roads and facilities that are no longer needed should be stabilized and re-seeded with native plants appropriate for the soil conditions and adjacent habitat and of local seed sources where feasible, per landowner requirements and commitments.
- 3. Existing substations and ancillary facilities should be re-used in repowering projects to the extent practicable.

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- 2558 4. Existing overhead lines may be acceptable if located away from high bird crossing
 2559 locations such as between roosting and feeding areas, or between lakes, rivers and
 2560 nesting areas. Overhead lines may be used when they parallel tree lines, employ bird
 2561 flight diverters, or are otherwise screened so that collision risk is reduced.
 - 5. Above-ground low and medium voltage lines, transformers and conductors should follow the 2006 or most recent APLIC "Suggested Practices for Avian Protection on Power Lines."
 - 6. Guyed structures should be avoided unless guy wires are treated with bird flight diverters or high visibility marking devices, or are located where known low bird use will occur.
 - 7. FAA visibility lighting of wind turbines should employ only red, or dual red and white strobe, strobe-like, or flashing lights, not steady burning lights
 - 8. Keep lighting at both operation and maintenance facilities and substations located within ½ mile of the turbines to the minimum required.
 - a. Use lights with motion or heat sensors and switches to keep lights off when not required.
 - b. Lights should be hooded downward and directed to minimize horizontal and skyward illumination.
 - c. Minimize use of high intensity lighting, steady-burning, or bright lights such as sodium vapor, quartz, halogen, or other bright spotlights.

2578 Decommissioning

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- Decommissioning is the cessation of wind energy operations and removal of associated equipment, roads, and other infrastructure. The land is then used for another activity.

 During decommissioning, contractors and facility operators should apply BMPs for road grading and native plant re-establishment to ensure that erosion and overland flows are managed to restore pre-construction landscape conditions. The facility operator, in conjunction with the landowner and state and federal wildlife agencies, should restore the natural hydrology and plant community to the greatest extent practical.
 - 1. Decommissioning methods should minimize new site disturbance and removal of native vegetation, to the greatest extent practicable.
 - Foundations should be removed to a depth of two feet below surrounding grade, and covered with soil to allow adequate root penetration for native plants and so that subsurface structures do not substantially disrupt ground water movements.
- 3. If topsoils are removed during decommissioning, they should be stockpiled and used as
 topsoil when restoring plant communities. Once decommissioning activity is complete,
 topsoils should be restored to assist in establishing and maintaining pre-construction
 native plant communities to the extent possible, consistent with landowner objectives.

- 4. Soil should be stabilized and re-vegetated with native plants appropriate for the soil conditions and adjacent habitat and of local seed sources where feasible, consistent with landowner objectives.
- Surface water flows should be restored to pre-disturbance conditions, including removal
 of stream crossings, roads, and pads, consistent with stormwater management
 objectives and requirements.
- Surveys should be conducted by qualified experts to detect invasive plants, and
 comprehensive approaches to controlling any detected plants should be implemented
 and maintained as long as necessary.
- 2605 7. Overhead pole lines that are no longer needed should be removed.
- 2606 8. After decommissioning, erosion control measures should be installed in all disturbance 2607 areas where potential for erosion exists, consistent with stormwater management 2608 objectives and requirements.
- 2609 9. Fencing should be removed unless the land owner will be utilizing the fence.
- 10. Petroleum product leaks and chemical releases should be remediated prior to2611 completion of decommissioning.

Chapter Four: Mitigation 2614

2615 During the coordination process between the project developer and USFWS, USFWS will 2616 identify important species of concern and their habitats that may occur in the area of 2617 interest which might be impacted by project development. As noted in Chapter 2C, the 2618 objective is to avoid or minimize adverse impacts, and when appropriate, to provide compensatory mitigation for unavoidable significant adverse impacts, as identified in the 2619 2620 tiered approach recommended in the Guidelines. All recommendations regarding avoidance, 2621 minimization and compensatory mitigation are voluntary on the part of the project 2622 proponent. However, it is the expectation that the project proponent will work with the USFWS to agree on mitigation recommendations. It is in the best interest of all parties to 2623 work together during the project development process to identify where mitigation may be 2624 2625 appropriate and feasible. This will avoid unnecessary project delays and allows for 2626 incorporation of the mitigation into the project design.

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If significant adverse impacts to habitat or species cannot be avoided, then opportunities to minimize impacts to the fullest extent practicable are pursued. For example, it may not be possible to avoid removing some forested habitat for a turbine string, but it may be possible to reduce the total amount of forest habitat removed through alternative placement of access roads and support structures. In addition, anticipated direct mortalities may be reduced by the application of operational adjustments.

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In cases where significant adverse impacts cannot be avoided or minimized, it may be possible to offset all, or a portion, of these impacts through additional minimization strategies or compensatory mitigation. One tool, used by the USFWS, is the USFWS Mitigation Policy which describes steps for addressing habitat loss in detail and includes information on Resource Categories (http://www.fws.gov/policy/501fw2.html) to assist in considering type and amount of compensatory mitigation to offset losses of habitat.

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For example, the resource goals for the following habitat resource categories are:

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2644 Resource Category 1: Avoid habitat loss

2645 Resource Category 2: No net loss of in-kind habitat value 2646 Resource Category 3: No net loss of out-of-kind habitat value

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Resource Category 4: Minimize loss of habitat value

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Other tools to determine appropriate compensatory mitigation may be used by developers and in coordination with USFWS and States. Recommended measures may include on- or off-site habitat improvement, and may consist of in-kind or out-of-kind compensatory mitigation. Compensatory measures may be project-specific or may be part of a mitigation

banking scenario. It is recommended that the method for implementing compensatory mitigation (e.g. fee title acquisition, in-lieu fee, conservation easement) be determined early in the process, if possible.

It may be possible to offset direct impacts of habitat loss to individuals, but this does not apply to federally listed threatened and endangered species. If a federal nexus exists, or if a project proponent chooses to seek an Incidental Take Permit (ITP), then impacts to listed species should be evaluated through the processes of Section 7 or 10 of the ESA.

Additional mitigation for <u>significant adverse</u> impacts from operations should be requested and implemented only if Tier 4 or Tier 5 studies determine that impacts cannot be adequately addressed by existing mitigation measures. Because in certain circumstances a project's impacts cannot be forecast with precision, the project proponent and the agencies may be unable to make some mitigation decisions until post-construction data have been collected. Mitigation measures implemented post-construction, whether in addition to those implemented pre-construction or whether they are new, are appropriate elements of the tiered approach. The general terms and funding commitments for future mitigation and the triggers or thresholds for implementing such compensation should be developed prior to or upon project operation and/or construction when possible. Mitigation beyond that implemented prior to or upon project operation should be well defined, bounded, and technically feasible, and commensurate with the project impacts.

It is anticipated that project proponents will take steps to avoid or minimize <u>adverse</u> impacts to species of concern and their habitats to the greatest extent practicable for that project. It is generally the case that project-impact assessment is a cooperative effort involving the developer, USFWS and the state wildlife agency and therefore, recommended mitigation measures will be consensus measures, and will not be additive. The state, tribe, and the USFWS may have different species or habitats of concern, however, according to their responsibilities and statutory authorities.

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Chapter Five:

Advancing Use, Cooperation, and **Effective Implementation of the Guidelines**

A. USFWS Adoption and Implementation of Guidelines

Process and Timeline for Developing Final USFWS Guidelines

The Secretary, through the Director of the USFWS, anticipates using the Committee's 2689 2690 written agreement as the basis of his or her guidance to the maximum extent possible, 2691 consistent with the Agency's legal obligations. Unless new information or public comments 2692 require changes, the Secretary anticipates publishing final guidance using the Guidelines

recommended by the Committee that are consistent with federal law. Following is an 2693

anticipated process and timeline for USFWS guidance development after the Committee 2694

2695 transmits its recommended Guidelines to the Secretary. The timeline is optimistic and the 2696

USFWS intends to make every effort to meet the goals as outlined barring unforeseen

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1. Recommendations to Secretary of Interior

Consistent with its Charter (noted below), the Committee is submitting to the Secretary of the Interior (Secretary) these Recommended Guidelines for "developing effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy facilities." The Committee understands that the Secretary will review the recommended Guidelines and will consider how to use them in developing final Guidelines.

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2. Step-down to the Director of the USFWS

2707 It is anticipated that the Secretary will transmit to the Director of USFWS the full set of recommended Guidelines, together with direction for their use in developing final 2708 Guidelines. While it is uncertain when this will occur, the Committee requests that the 2709 Secretary review the recommendations as soon as possible, or by end of winter of 2710 2009/2010. 2711

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3. USFWS develops draft guidelines

The Committee recommends that the Secretary direct the USFWS to use the Committee's 2714

recommended Guidelines to develop its final Guidelines. The Committee recommends that 2715

the USFWS choose to adopt the recommended Guidelines in full. The Committee 2716

understands that the USFWS currently anticipates that revisions to the recommended 2717

Guidelines would be minor and editorial or technical in nature. 2718

- The Committee understands that the final Guidelines will be developed by a USFWS Task 2720
- Force to be convened as soon as possible following the step-down from the Secretary. The 2721
- Task Force will be comprised of key USFWS staff from Regional and Field offices with 2722
- 2723 knowledge, skills, and experience related to wind energy development. The Committee
- requests that the Task Force complete their work as soon as possible or by Spring 2010, 2724
 - depending on when the Secretary forwards his direction to the Director of USFWS.

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4. Publication/Solicitation of comments

- 2728 The Committee understands that a Notice of Proposed Guidance will be published in the
- Federal Register and made available for public comment. The Committee understands that 2729
- the USFWS anticipates a 90-day comment period. 2730

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5. Comment review and response

- USFWS will review and respond to all comments received during the comment period. The 2733
- response time will depend up on the quantity and detail of the comments received. 2734
- 2735 However, USFWS anticipates that it will require at least 60 days to respond to the comments
- and make necessary changes to the Guidelines. 2736

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6. Publication of final Guidelines

- The Committee recommends that the USFWS will publish the final Guidelines and response 2739
- to comments in the Federal Register in the Summer of 2010. 2740

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General Considerations

1. Consistent Application

- The Committee recommends that USFWS inform all Regional and Field staff of the premises 2744
- from which these Guidelines were developed. USFWS should provide guidance and training 2745
- to all USFWS staff involved in wind energy development for implementation of final USFWS 2746
- Guidelines to promote their consistent application; provide direction on how to 2747
- 2748 accommodate flexibility in addressing site specific conditions; and facilitate agency and
- industry understanding of recommended actions. Guidance should include the need for 2749
- flexibility to address diverse geographic regions, habitat types, and wind energy 2750
- 2751 development projects. USFWS should ensure that Regional and/or Washington office staff is
- 2752 available to provide guidance to the field staff for consistent application of the guidelines.
- Guidance also will be provided to assist in addressing developer concerns that cannot 2753
- otherwise be resolved in a timely fashion at the field level. 2754

- 2756 USFWS, environmental, and industry representatives should continue to be involved with
- 2757 the development of BMPs for project design, operation and compensatory mitigation, based

on best available science, to minimize <u>adverse</u> impacts to species of concern and their habitats from wind energy projects. USFWS will review BMPs periodically and revise as necessary to reflect new knowledge gained from current science, monitoring results, and experience with wind energy projects. All USFWS staff involved in review of wind energy projects should be trained in use of BMPs.

2. Training

USFWS should provide training to ensure that all Regional and Field staff have the knowledge, skill, and ability to implement the USFWS Guidelines. The Committee recommends that training be provided through hands-on workshops conducted in each USFWS Region, with priority for the first workshops to be scheduled in areas of high wind energy development activity. Each workshop should be planned in consultation with and open to participants from USFWS, industry, states, tribes NGOs and other appropriate participants, with the goal of developing partnerships to minimize adverse impacts to species of concern and their habitat while allowing flexibility for wind energy development.

3. Staff Support

The Committee recommends that the Chief of Division of Habitat and Resource Conservation be designated lead on development and implementation of these Guidelines. The Committee recommends that the USFWS set a priority to work within its budget constraints to provide staff support to review wind energy development projects in a timely and efficient manner. To supplement its staff efforts, USFWS should encourage state cooperative arrangements and participation in review of potential wind energy projects. USFWS encourages project proponents to coordinate early in the project development process to facilitate timely involvement and feedback. USFWS should also explore the collocation of additional staff in Bureau of Land Management Pilot Offices for renewable energy, and the creation of new co-located renewable offices. USFWS should continue to explore new technologies and research findings to improve its ability to avoid wildlife detriments while streamlining the review process.

Phase-in for using Committee's recommended Guidelines

The recommended tiered approach in these Guidelines may not be immediately applicable at wind projects in the development or operational phase because the tiered approach requires many months or years to plan and implement. Accordingly the recommendations contained in Tiers 1 through 5 become effective twenty-four months after the date USFWS publishes final Guidelines (the "Effective Date"). This will allow USFWS and State wildlifeagency managers and field-office personnel, wildlife consultants, wind-industry developers, NGOs, and other government agencies time for training and adjustments.

 An important incentive to voluntary adoption of the tiered approach is that after the Guidelines are published USFWS will take a project proponent's adherence to the Guidelines and communication with USFWS fully into account as evidence of due care when exercising

its enforcement discretion under the MBTA and BGEPA. A benefit of following the approach recommended in the Guidelines is that in the event of later adverse environmental impacts, the project proponent will be able to demonstrate that it adhered to the Guidelines, communicated with USFWS, and considered the advice of USFWS in project siting, construction and operation.

USFWS encourages use of the Guidelines and adoption of the tiered approach by future and existing wind projects. Accordingly, all projects that commence after the Effective Date should apply the tiered approach to all phases of the project. However, projects that have already commenced are not expected to start over or return to the beginning of a specific tier. Instead, these projects should implement those portions of the Guidelines relevant to the continuing phases of the project. For projects that are already operational prior to the Effective Date, they should adhere to the recommendations in Tier 4, and if applicable, Tier 5.

For projects commencing after the Effective Date of the Guidelines, 'voluntary adherence and communication' shall mean that the project proponent has applied the Guidelines, including the tiered approach, through site selection, design, construction, operation and post-operation phases of the project, and has communicated with USFWS and considered its advice. For projects commencing prior to the Effective Date of the Guidelines, 'voluntary adherence and communication' shall mean that the project proponent has communicated with USFWS early in the process and can produce records that demonstrate that they have applied recommendations of the tiered approach relevant to activities at the project which occur after the date the USFWS publishes final guidelines. In either case, USFWS will take such adherence and communication fully into account when exercising its discretion with respect to any potential referral for prosecution under the MBTA and BGEPA. USFWS retains its existing authority to inspect and assess the sufficiency of these records.

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B. Project Development and Coordination with the USFWS

- 2827 Coordination and/or Consultation with USFWS
- 2828 The Committee recommends that the Secretary direct the USFWS to consider the varying
- 2829 circumstances in which a wind energy project may be developed, and provide clear
- 2830 explanation and expectation to users of the Guidelines of how the Guidelines will be
- 2831 implemented for each instance. Explanation should include guidance for projects developed
- 2832 with or without a federal nexus.
- 2833 Ensuring timely project review
- 2834 The Committee recommends that the USFWS:

• Work within its budget constraints to provide staff support to review wind energy development projects in a timely and efficient manner.

- Encourage state cooperative arrangements and participation in review of potential wind energy projects to supplement its staff efforts.
- Encourage project proponents to coordinate early in the project development process to facilitate timely involvement and feedback.
- Explore agreements with other federal agencies to help fund staff positions, such as the BLM Pilot Project offices for oil and gas or the BLM Renewable Offices; and
- Continue to explore cutting edge technology to further streamline the review process, such as IPaC (Information Planning and Consultation System).

Conflict Resolution

Conflict resolution under the provisions of the Guidelines needs to be expeditious and effective. In order to increase use of the Guidelines, conflict resolution should be applied consistently across USFWS regions. USFWS and developers should attempt to resolve any conflicts arising from use of the Guidelines at the field or regional office level. Deliberations should be in the context of the intent of the Guidelines and be based on the site-specific conditions and the best available data. However, if there is an issue that cannot be resolved within a standard time frame, the developer should have the option to bring the issue to a designated individual/team in the Washington office. The designated individual/team USFWS Washington Office representative should work with the Regional/field office and the developer to ensure that a resolution is obtained in a timely manner. If the issue is unresolved, he USFWS representative on these Guidelines will facilitate resolution if it requires elevation within USFWS. The FAC recommends that the USFWS shepherd the disputed issue(s) up the USFWS chain of command, if necessary.

Consideration of the Guidelines in MBTA and BGEPA Enforcement

The Committee recommends that the Department adopt the following statement:

"Consideration of the Guidelines in MBTA and BGEPA Enforcement

The Service urges voluntary adherence to the Guidelines and communication with the Service when planning and operating a facility. The Service will regard such voluntary adherence and communication as evidence of due care with respect to avoiding, minimizing, and mitigating impacts to species protected under the MBTA and BGEPA, and will take such adherence and communication fully into account when exercising its discretion with respect to any potential referral for prosecution related to the death of or injury to any such species. Each developer will be responsible for maintaining internal records sufficient to demonstrate adherence to the Guidelines. Examples of these records could include: studies performed in the implementation of the tiered approach; an internal or external review or audit process; an avian and bat protection plan; or a wildlife management plan. The Service retains its existing authority to inspect and assess the sufficiency of those records."

2878 Optional Use of Avian and Bat Protection Plan (ABPP)

- 2879 An Avian Bat Protection Plan (ABPP) is a company- or project-specific document that
- 2880 provides a description of actions to responsibly address the applicable wildlife issues
- associated with wind energy development; the avoidance, minimization and (as
- appropriate) mitigation measures; and the management activities that a company or project
- owner will conduct to protect birds and bats. Although the details of each company's or
- 2884 project's ABPP will be different, the overall goals of any ABPP include describing the actions
- and/or processes to implement and demonstrate adherence to the Guidelines in the
- 2886 development, construction and operation of wind energy projects.

2887 Corporate ABPP

- 2888 A corporate ABPP documents the processes a company uses to implement the Guidelines
- for all of its wind energy projects. Key elements usually include a corporate policy
- 2890 commitment to minimize <u>adverse</u> impacts to wildlife; specific processes to be used to
- reduce impacts to birds and bats during each stage of wind energy project development,
- 2892 construction, and operations; permit compliance systems; and implementation tools,
- 2893 including training, auditing, and reporting.

2894 **Project-specific ABPP**

- 2895 Companies that adopt corporate ABPPs may in many cases also "step down," or implement,
- 2896 the corporate ABPP for some or all of its projects via project-specific ABPPs. In other cases,
- a company may develop only the project-specific ABPP.

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- 2899 A project-specific ABPP documents the bird and bat impact avoidance, minimization and (if
- 2900 applicable) mitigation measures for a specific site. Typically a project-specific ABPP will
- 2901 document the analyses, studies, and reasoning that have supported progressing from one
- tier to the next in the tiered approach laid out in the Guidelines. A project-specific ABPP will
- often be a plan developed in stages, over time, as the analysis and studies are undertaken
- 2904 for each tier.

2905 C. Federal Interagency Coordination and Cooperation

2906 The Committee recommends that the Chief of Division of Habitat and Resource

Conservation, USFWS, employ the following strategies to ensure the timely and consistent

2908 review of wind energy projects by federal agencies:

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- Establish an interagency working group to optimize federal coordination and use of the USFWS national Guidelines to the greatest extent possible, to advance consistency and avoid duplication in the federal review and permitting process as it relates to wind development.
- relates to will development.

- 2. USFWS should work with other federal agencies to provide incentives for adopting and using USFWS national Guidelines, encourage early coordination for projects that
- and using USFWS national Guidelines, encourage early coordination for projects that may affect wildlife resources, and use interagency meetings to promote consistency.

2919 3. USFWS should establish and maintain a readily accessible national repository of BMPs for wind/wildlife interactions to increase efficiency, interagency coordination, and state and industry use of best management practices.

4. Assist public lands management agencies in identifying landscapes that include important habitats and ecosystem components that merit special attention in considering wind energy development.

5. Cooperate with USDA-NRCS and USDA FSA to ensure that agricultural conservation programs – including but not limited to CRP, WRP, GRP, and FRPP – are implemented and managed in a manner consistent with the Guidelines.

USFWS should coordinate with other agencies that require data collection at a wind energy site to promote consistent methodology and reporting requirements, while also accommodating individual site conditions and practical limitation

D. USFWS-State Coordination and Cooperation

USFWS should encourage states to increase compatibility between state guidelines and these voluntary Guidelines, protocols, data collection methods, and recommendations relating to wildlife and wind energy. While these Guidelines contain recommendations that are generally applicable at the federal, state and local levels across the country, some specific recommendations contained herein may not be standard practice in all states. States that desire to or those that have formally adopted wind energy siting, permitting or environmental review regulations or guidelines are encouraged to cooperate with USFWS to develop consistent state level guidelines. USFWS should confer, coordinate and share its expertise with interested states when a state lacks its own guidance or program to address wind/wildlife interactions. The USFWS should also use states' technical resources as much as possible and appropriate.

USFWS should establish a voluntary state/federal program to advance cooperation and compatibility between USFWS and interested state and local governments for coordinated review of wind energy projects under both federal and state wildlife laws. USFWS and interested states are encouraged to reach agreements to foster consistency in review of wind energy projects using the following tools:

• Cooperation agreements with interested state governments.

 Joint agency reviews to reduce duplication and increase coordination in project review.

- A communication mechanism
- to share information about prospective wind energy projects,

2960 2961 2962 2963 2964 2965	 to coordinate project review, and to ensure that state and federal regulatory processes, and/or mitigation requirements are being adequately addressed. to ensure that species of concern and their habitats are fully addressed. Establishing consistent and predictable joint protocols, data collection methodology
2966 2967 2968	 and study requirements to satisfy wind energy project review and permitting. Designating a USFWS management contact within each regional office (or nationally
2969 2970 2971	 to assist field offices working with states and local agencies to resolve significant wildlife-related issues that cannot be resolved at the field level. Cooperative state/federal/industry research agreements relating to wind energy
2972297329742975	 Cooperative state/federal/industry research agreements relating to wind energy project-wildlife interactions. States without their own guidelines should consider waiting for the USFWS
2976 2977 2978	Guidelines in order to ensure compatibility with those guidelines. USFWS Role
2979 2980 2981 2982 2983 2984 2985 2986 2987	 Provide training to states Foster development of a national geographic data base that identifies development-sensitive ecosystems and habitats. Support a national database for reporting of mortality data on a consistent basis. Establish national BMPs for wind energy development projects Develop recommended guidance on study protocols, study techniques, and measures and metrics for use by all jurisdictions Assist in identifying and obtaining funding for national research priorities
2988	E. USFWS-Tribal Coordination and Cooperation
2989 2990 2991 2992	Tribal coordination is not important only in federal discussions. Many tribal traditional lands and tribal rights extend outside federal lands onto state regulated lands. In addition, tribal interests are impacted in even private land developments. A discussion of tribal input to all projects is important.
2993	Authorities for Federal-Tribal Coordination
2994 2995 2996 2997	The Federal government maintains a special trust relationship with Indian tribes pursuant to treaties, statutes, Executive Orders, regulations, and judicial decisions. The federal government and USFWS affirmed these obligations to Indian tribes in Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments", and Presidential

Memorandum "Government-to-Government Relations with Native American Tribal

Governments" (April 29, 1994), Joint Secretarial Order 3206 "American Indian Tribal Rights,

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FederalTribal Trust Responsibilities, and the Endangered Species Act (updated January 16, 2008), and The Native American Policy of the U.S. Fish & Wildlife Service (June 28, 1994).

Tribal Coordination

Accordingly, the USFWS shall seek to establish and maintain effective government-to-government working relationships with tribes to achieve the common goal of promoting and protecting the fish, wildlife and their habitat. Whenever USFWS is aware that their actions and activities may impact tribal trust resources, the exercise of tribal rights, or Indian lands (both lands held in trust for tribes and individual Indians and lands owned by tribes or individual Indians subject to restrictions on alienation), the USFWS shall consult and coordinate with, and seek the participation of, the affected Indian tribes to the maximum extent practicable. This shall include providing affected tribes adequate opportunities to participate in data collection, consensus seeking, comment, and associated processes. To facilitate the government-to-government relationship, the USFWS may coordinate their discussions with a representative from an intertribal organization, if so designated by the affected tribe(s).

Jurisdiction on Tribal Lands

The USFWS recognizes that Indian tribes value and take responsibility for the management of their lands and resources. As Indian lands, whether held in trust by the United States for the use and benefit of Indians or owned exclusively by an Indian tribe, are not subject to the controls or restrictions set forth in federal public land laws. Indian lands are not federal public lands or part of the public domain, but are rather retained by tribes or set aside for tribal use pursuant to treaties, statutes, court orders, executive orders, judicial decisions, or agreements. Accordingly, Indian tribes manage Indian lands in accordance with tribal goals and objectives, within the framework of applicable laws.

Except when determined necessary for investigative or prosecutorial law enforcement activities, or when otherwise provided in a federaltribal agreement, the USFWS, to the maximum extent practicable, shall obtain permission from tribes before knowingly entering Indian reservations and tribally-owned fee lands and shall communicate as necessary with the appropriate tribal officials. If a tribe believes this section has been violated, such tribe may file a complaint with the Secretary of the Interior, who shall promptly investigate and respond to the tribe.

Tribal Conservation and Management Plans

The USFWS acknowledges that Indian tribes value, and exercise responsibilities for, management of Indian lands and tribal trust resources. As such, the USFWS shall give deference to tribal conservation and management plans for tribal trust resources that: (a) govern activities on Indian lands, including, for purposes of these plans, tribally-owned fee lands, and (b) address the conservation needs of tribal resources. The USFWS shall conduct government-to-government consultations to discuss the extent to which tribal resource

management plans for tribal trust resources outside Indian lands can be incorporated into actions to address the conservation needs of tribal resources.

Communication with other Agencies

- 3042 USFWS will encourage and facilitate communication and cooperation among tribal
- 3043 governments, States, Federal agencies and others to identify and delineate respective roles
- and responsibilities and to ensure that issues of common interest and concern are discussed.
- This may include such activities as taking the initiative, as lead federal agency in this process,
- 3046 to provide the biological or managerial expertise necessary for resolution of conflicts about
- 3047 fish and wildlife resource issues. This may include but is not limited to coordination and
- 3048 cooperation with other fish and wildlife management agencies, such as the National Marine
- 3049 Fisheries Service.

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3050 Intergovernmental Agreements for Sensitive Species

- The USFWS shall, when appropriate and at the request of an Indian tribe, pursue
- intergovernmental agreements to formalize arrangements for candidate, proposed, and
- 3053 listed species such as, but not limited to, land and resource management, multi-jurisdictional
- 3054 partnerships, cooperative law enforcement, and guidelines to accommodate Indian access
- to, and traditional uses of, natural products. Such agreements shall strive to establish
- partnerships that harmonize the USFWS mission with the Indian tribe's own ecosystem
- 3057 management objectives.

Coordination on Cultural Resources Issues

- 3059 Tribes and the USFWS both recognize the relationship between habitat resources and
- 3060 cultural and historic resources. USFWS and its Cultural Resources Program manage the array
- 3061 of cultural resources under its jurisdiction. Therefore the USFWS shall consult with
- 3062 appropriate Indian tribe(s) to identify the cultural or religious interests, the traditional
- practices, aboriginal use areas, historic and sacred sites, artifacts, archeological sites, and
- treaty rights that could be affected by USFWS actions on Indian lands held in trust by the
- 3065 federal government. USFWS will be guided in this respect by such legislation as the National
- 3066 Historic Preservation Act, Native American Graves Protection and Repatriation Act,
- 3067 Archaeological Resources Protection Act, and the American Indian Religious Freedom Act.

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- USFWS should work with tribes with the goal to promote compatibility between tribal and
- 3070 federally recommended wildlife protocols, data collection methods, and requirements
- relating to wildlife and wind energy. These wind energy Guidelines contain
- recommendations that may be generally applicable at the federal, state, tribal and local
- 3073 levels across the country, as well as policies, measures and incentives that are focused on
- 3074 USFWS policies, procedures, goals and regulations, and those of other federal
- agencies. Some of the specific recommendations may not be applicable at the tribal
- 3076 government level. Those Indian tribes that desire to or that have formally adopted wind
- 3077 energy siting, permitting or environmental review regulations or guidelines may contact
- 3078 USFWS for technical assistance (including consultation, as necessary, with the Office of the
- 3079 Solicitor) in order to minimize conflicting or unnecessary requirements resulting from

different tribal versus federal practices. In addition, USFWS should confer, coordinate and share its expertise with interested Indian tribes when a tribe lacks its own guidance or program to address wind and wildlife interactions.

The Committee recommends that USFWS establish a voluntary tribal/federal cooperation program to promote cooperation and compatibility between USFWS and interested tribal governments for coordinated review of wind energy projects under applicable federal wildlife laws. Formal agreements between USFWS and Indian tribes may be explored. Cooperation between Indian tribes and USFWS may include the following elements:

- Strengthening a cooperative approach to the management of fish and wildlife
 habitat on Indian lands through potential mutually cooperative agreements,
 memoranda of understanding, or memoranda of agreement with interested tribal
 governments to promote coordinated, consistent review of wind energy projects for
 compliance with applicable federal wildlife laws.
- Provision for voluntary joint agency reviews and other appropriate measures to reduce duplication and increase coordination between tribal governments and USFWS in reviewing wind energy projects.
- Fostering of communication between Indian tribes and USFWS to ensure that the
 party first obtaining the information about a prospective wind energy project will
 notify the other party to enable joint planning on how to coordinate review of the
 project.
- Identification of representatives of an Indian tribe who is responsible to work with the USFWS regional office to coordinate review of proposed wind activities under applicable wildlife laws.
- Establishment of consistent and predictable joint protocols, data collection
 methodology, and study requirements that can be used by USFWS and Indian tribes
 to satisfy wind energy project permitting and environmental review requirements.
- Designation of a USFWS management contact within each regional office (or nationally) who is available as a resource to the field offices to work with Indian tribes to resolve significant wildlife-related issues that may arise at wind energy projects that cannot be resolved at the field office.
- Establishment of cooperative tribal/federal/industry research agreements relating to wind energy project-wildlife interactions.
- Indian tribes must have the confidence that developers are considering tribal resources that may be at risk and ensure that tribal regulatory processes or mitigation requirements are being addressed in project development.

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Additional Optional Arrangements between Indian tribes and USFWS:

- USFWS should support and promote the establishment of negotiated agreements with interested Indian tribes that specify additional coordination, review and compliance responsibilities for ensuring wind energy project compatibility with applicable wildlife laws.
- In administering this tribal/federal partnership program, the Committee recommends that USFWS and the Indian tribes provide differing but complementary services:

USFWS Services:

- Provide training to Indian tribes.
- Support and/or manage a national database for reporting of mortality data on a consistent basis.
- Establish and maintain national "best management practices" for wind energy project siting and operation based on project experience and learning.
- Establish and revise recommended guidance on study protocols, study techniques, and measures and metrics for use by all jurisdictions.
- Assist in identification and pursuit of funding for national research priorities.

3142 Indian tribes Services:

- Consider the voluntary national Guidelines as the minimum foundation of an Indian tribe's approach to wind and wildlife review.
- Consider sharing information by reporting project monitoring data and results received from the project developer to national database at USFWS.

3147 F. NGO Actions

- 3148 If a specific project involves actions at the local, state, or federal level that provide
- 3149 opportunities for public participation, non-governmental organizations (NGOs) can provide
- meaningful contributions to the discussion of biological issues associated with that project,
- through the normal processes such as scoping, testimony at public meetings, and comment
- processes. In the absence of formal public process, there are many NGOs that have
- 3153 substantial scientific capabilities and may have resources that could contribute productively
- to the siting of wind energy facilities. Several NGOs have made significant contributions to
- the understanding of the importance of particular geographic areas to wildlife in the United
- 3156 States. This work has benefited and continues to benefit from extensive research efforts
- and from associations with highly qualified biologists. NGO expertise can as can scientific
- expertise in the academic or private consulting sectors serve highly constructive purposes.
- 3159 These can include:

- Providing information to help identify environmentally sensitive areas, during the screening phases of site selection (Tiers 1 and 2, as described in this document)
- Providing feedback to developers and agencies with respect to specific sites and site and impact assessment efforts
- Helping developers and agencies design and implement mitigation or offset strategies
- Participating in the defining, assessing, funding, and implementation of research efforts in support of improved predictors of risk, impact assessments and effective responses
- Articulating challenges, concerns, and successes to diverse audiences

NGO Conservation Lands

Implementation of these Guidelines by USFWS and other state agencies will recognize that lands owned and managed by non-government conservation organizations represent a significant investment that generally supports the mission of state and federal wildlife agencies. Many of these lands represent an investment of federal conservation funds, through partnerships between agencies and NGOs. These considerations merit extra care in the avoidance of wind energy development impacts to these lands. In order to exercise this care, the Committee recommends that the USFWS and allied agencies coordinate and consult with NGOs that own lands which might reasonably be impacted by a wind energy project under review.

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Appendix A: **Glossary & List of Acronyms**

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Acceptable/unacceptable - In the tiered approach described in these Guidelines, the individuals and institutions involved in the decision process agree that risk and/or impacts are acceptable or unacceptable.

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Accuracy – The agreement between a measurement and the true or correct value.

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Adaptive management – An iterative decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. The term as used in the recommendations and the guidelines specifically refers to "passive" adaptive management, in which alternative management activities are assessed, and the best option is designed, implemented, and evaluated.

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Anthropogenic - resulting from the influence of human beings on nature

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Area of interest – For most projects, the area where wind turbines and meteorological towers are proposed or expected to be sited and the area of potential impact.

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Avian - Pertaining to or characteristic of birds.

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Avoid - To not take an action or parts of an action, in order to avert the potential effects of the action or parts thereof. First of three components of "mitigation" as defined in USFWS Mitigation Policy. (See mitigation.)

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Before-after/control-impact (BACI) – A study design that involves comparisons of observational data, such as bird counts, before and after an environmental disturbance in a disturbed and undisturbed site. This study design allows a researcher to assess the effects of constructing and operating a wind turbine by comparing data from the "control" sites (before and undisturbed) with the "treatment" sites (after and disturbed).

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Best management practices (BMPs) - methods that have been determined by the 3217 stakeholders to be the most effective, practicable means of avoiding or minimizing 3218 3219 significant adverse impacts to individual species, their habitats or an ecosystem, based on 3220 the best available information.

Buffer zone – A neutral zone surrounding a resource designed to protect the resource from adverse impact, and/or a zone surrounding an existing or proposed wind facility for the purposes of data collection and/or impact estimation.

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Compensatory mitigation – Replacement of project-induced losses to fish and wildlife resources. Substitution or offsetting of fish and wildlife resource losses with resources considered to be of equivalent biological value.

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In-kind – Providing or managing substitute resources to replace the value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate to those lost. Out-of-kind - Providing or managing substitute resources to replace the value of the

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resources lost, where such substitute resources are physically or biologically different from those lost. This may include conservation or mitigation banking, research or other options. 3235

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Cost effective – Economical in terms of tangible benefits produced by money spent.

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Covariate - Covariates are uncontrolled random variables that influence a response to a treatment or impact but that do not interact with any of the treatments or impacts being tested.

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Critical habitat – For listed species, consists of the specific areas designated by rule making pursuant to Section 4 of the Endangered Species Act and displayed in 50 CFR § 17.11 and 17.12.

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Cumulative impacts – See impact.

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3250 3251 Displacement - Displacement is the loss of habitat as result of an animal's behavioral avoidance of otherwise suitable habitat. Displacement may be short-term, during the construction phase of a project, temporary as a result of habituation, or long-term, for the life of the project.

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Ecosystem - A system formed by the interaction of a community of organisms with their physical and chemical environment. All of the biotic elements (i.e., species, populations, and communities) and abiotic elements (i.e., land, air, water, energy) interacting in a given geographic area so that a flow of energy leads to a clearly defined trophic structure, biotic diversity, and material cycles. USFWS Mitigation Policy adopted definition from E. P. Odum 1971 Fundamentals of Ecology

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Endangered species – See listed species.

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3263 **Extirpation** – the species ceases to exist in a given location. The species still exists 3264 elsewhere.

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Appendix A: Glossary 80 **Fatality** – An individual instance of death.

Fatality rate – The ratio of the number of individual deaths to some parameter of interest such as megawatts of energy produced, the number of turbines in a wind facility, the number of individuals exposed, etc, within a specified unit of time.

Feathering - A form of curtailment for wind turbines that involves either reducing the angle into the wind of individual blades to reduce their angle into the wind, thereby reducing rotor speed, or by turning the whole unit out of the wind. When rotors are feathered they are pitched parallel to the wind, essentially making them stationary.

Federal action agency - A department, bureau, agency or instrumentality of the United States which plans, constructs, operates or maintains a project, or which reviews, plans for or approves a permit, lease or license for projects, or manages Federal lands.

Federally listed species – See listed species.

Footprint – the geographic area occupied by the actual infrastructure of the development such as wind turbines, access roads, substation, overhead and underground electrical lines, and buildings.

G1 - (Global Conservation Status Ranking) Critically imperiled: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 - (Global Conservation Status Ranking) Imperiled: At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.

G₃ – (Global Conservation Status Ranking) Vulnerable: At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Guy wire - Wires used to secure wind turbines or meteorological towers that are not self-supporting.

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3300 **Habitat** - The area which provides direct support for a given species, including adequate

Habitat fragmentation - The separation of a block of habitat for a species into segments, such that the genetic or demographic viability of the populations surviving in the remaining habitat segments is reduced.

Impact – an effect or effects on natural resources and on the components, structures, and functioning of affected ecosystems.

food, water, space, and cover necessary for survival.

Appendix A – Glossary & Acronyms Cumulative – changes in the environment caused by the aggregate of past, present and 3309 reasonably foreseeable future actions on a given resource or ecosystem. 3310 Direct – effects on individual species and their habitats caused by the action and occur 3311 at the same time and place. 3312 Indirect impact - effects caused by the action and are later in time or farther removed in 3313 distance, bur are still reasonably foreseeable. 3314 Legal significance -3315 3316 Infill - Add an additional phase to the existing project, or build a new project adjacent to 3317 3318 existing projects. 3319 3320 In-kind compensatory mitigation - See compensatory mitigation. 3321 Intact habitat - An expanse of habitat for a species or landscape scale feature, unbroken 3322 with respect to its value for the species or for society. 3323 3324 Intact landscape - relatively undisturbed areas characterized by maintenance of most 3325 original ecological processes and by communities with most of their original native species 3326 3327 still present. 3328 **Lambda** (λ) – Population growth rate. 3329 3330 Lattice design - A wind turbine support structure design characterized by horizontal or 3331 diagonal lattice of bars forming a tower rather than a single tubular support for the nacelle 3332 and rotor. 3333 3334

Lead agency - Agency that is responsible for federal or non-federal regulatory or environmental assessment actions.

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Lek - A traditional site commonly used year after year by males of certain species of birds (e.g., greater and lesser prairie-chickens, sage and sharp-tailed grouse, and buff-breasted sandpiper), within which the males display communally to attract and compete for female mates, and where breeding occurs.

Listed species - Any species of fish, wildlife or plant which has been determined to be endangered or threatened under section 4 of the ESA (50 CFR §402.02), or similarly designated by state law or rule.

Local population – A subdivision of a population of animals or plants of a particular species that is in relative proximity to a project.

Loss – As used in this document, a change in wildlife habitat due to human activities that is considered adverse and: (1) reduces the biological value of that habitat for species of concern; (2) reduces population numbers of species of concern; (3) increases population

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Comment [SSS8]: A proposed definition may be provided for FAC

numbers of invasive or exotic species; or (4) reduces the human use of those species of 3353 3354 3355 Megawatt (MW) - A measurement of electricity-generating capacity equivalent to 1,000 3356 kilowatts (kW), or 1,000,000 watts. 3357 3358 Migration - Regular movements of wildlife between their seasonal ranges necessary for 3359 3360 completion of the species lifecycle. 3361 Migration corridor - Migration routes and/or corridors are the relatively predictable 3362 pathways that a migratory species travel between seasonal ranges, usually breeding and 3363 3364 wintering grounds. 3365 Migration stopovers - Areas where congregations of birds assemble during migration that 3366 supply high densities of food, such as wetlands and associated habitats. 3367 3368 Minimize - To reduce to the smallest practicable amount or degree. 3369 3370 3371 Mitigation (General definition) - avoiding, minimizing, and compensating for unavoidable impacts. Comment [ejk9]: General definition 3372 (Specific to these Guidelines) - avoiding or minimizing adverse impacts, and when Comment [ejk10]: Recommended 3373 definition from the Synthesis appropriate, compensating for unavoidable significant adverse impacts, as identified in 3374 Workgroup the tiered approach recommended in the Guidelines. 3375 3376 Mitigation banking -Comment [SSS11]: A proposed 3377 definition may be provided for FAC 3378 Monitoring - A process of project oversight; also, making measurements of uncontrolled 3379 events at one or more points in space or time with space and time being the only 3380 experimental variable or treatment. 3381 3382 Mortality rate - Population death rate, typically expressed as the ratio of deaths per 100,000 3383 individuals in the population per year (or some other time period). 3384 3385 3386 **Operational modification** – Deliberate changes to wind energy facility operating protocols, 3387 such as the wind speed at which turbines "cut in" or begin generating power, undertaken 3388 with the object of reducing collision fatalities. 3389 3390 Passerine - Describes birds that are members of the Order Passeriformes, typically called "songbirds." 3391 3392 Population - A demographically and genetically self-sustaining group of animals and/or 3393

Practicable - capable of being done or accomplished; feasible.

plants of a particular species.

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Prairie grouse – A group of gallinaceous birds, includes the greater prairie chicken, the lesser prairie chicken, and the sharp-tailed grouse, occuring in the Great Plains of North America.

Project area – The area that includes the project site as well as contiguous land that shares relevant characteristics.

Project commencement – The point in time when a project proponent begins its preliminary evaluation of a broad geographic area to assess the general ecological context of a potential site or sites for wind energy development. For example, this may include the time at which an option is acquired to secure real estate interests, an application for federal land use has been filed, or land has been purchased.

Project Site - The land that is included in the project where development occurs or is proposed to occur.

Project transmission lines – Electrical lines built and owned by project developer.

Raptor – As defined by the American Ornithological Union, a group of predatory birds including hawks, eagles, falcons, osprey, kites, owls, vultures and the California condor.

Relative abundance - The number of organisms of a particular kind as a percentage of the total number of organisms within a given area or community.

Risk – The likelihood that adverse effects may occur to individual animals or populations of species of concern, as a result of wind energy development and operation. For detailed discussion of risk and risk assessment as used in this document, see [Chapter 2B]

Rotor - The part of a wind turbine that interacts with wind to produce energy. It consists of the turbine's blades and the hub to which the blades attach.

Rotor-swept area – The area of the circle or volume of the sphere swept by the turbine blades.

Rotor-

Rotor-swept zone - The altitude within a wind facility which is bounded by the upper and lower limits of the rotor-swept area and the spatial extent of the facility.

 S1 – (Subnational Conservation Status Ranking) Critically imperiled: Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.

S2 – (Subnational Conservation Status Ranking) Imperiled: Imperiled in the jurisdiction because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction.

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S3 – (Subnational Conservation Status Ranking) Vulnerable: Vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Sage grouse – A large gallinaceous bird living in the sage steppe areas of the intermountain west, including the greater sage grouse and Gunnison's sage grouse.

Significant – Significant shall be defined to include both context and intensity. Context means that the significance of an action may consider the affected region and the locality. In the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the state or the country as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity of impact, and would often include consideration of the degree to which the proposed action affects wetlands, wild and scenic rivers, and ecologically critical areas. Considerations of significance include the following:

• Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment;

 The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973;

 Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment (Council on Environmental Quality Definitions from 40 CFR 1500-1508).

Species of concern - For a particular wind energy project, any species which (i) is listed as an endangered, threatened or candidate species under the Endangered Species Act, is subject to the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act, or is designated by law, regulation or other formal process for protection and/or management by the relevant agency or other authority, or has been shown to be significantly adversely affected by wind energy development, and (ii) is determined to be possibly affected by the project.

Species of habitat fragmentation concern – Species of concern whose genetic or demographic viability is reduced by separation of their habitats into smaller blocks, thereby reducing connectivity, and for which habitat fragmentation from a wind development project may create significant barriers to genetic or demographic viability of the affected population.

String – A number of wind turbines oriented in close proximity to one another that are usually sited in a line, such as along a ridgeline.

Strobe – Light consisting of pulses (of light) that are high in intensity and short in duration.

3485	Threatened species – See listed species.
3486 3487 3488 3489	Tubular design - A type of wind turbine support structure for the nacelle and rotor that is cylindrical rather than lattice.
3490 3491 3492	Turbine height - The distance from the ground to the highest point reached by the tip of the blades of a wind turbine.
3493 3494 3495 3496	Voltage (low and medium) – Low voltages are generally below 600 volts, medium voltages are commonly on distribution electrical lines, typically between 600 volts and 110 kV, and voltages above 110 kV are considered high voltages.
3497 3498 3499 3500	Wildlife management plan - A document describing actions taken to identify resources that may be impacted by proposed development; measures to mitigate for any adverse impacts; any post-construction monitoring; and any other studies that may be carried out by the developer.
3501 3502 3503	Wind turbine - A machine for converting the kinetic energy in wind into mechanical energy, which is then converted to electricity.
3504	Acronyms:
3505	ABPP – Avian bat protection plan
3506	APLIC – Avian Power Line Interaction Committee
3507	APWRA – Altamont Pass Wind Resource Area
3508	BA – Before-After analysis
3509	BACI – Before-After Control-Impact study design
3510	BGEPA – Bald and Golden Eagle Protection Act
3511	BLM – Bureau of Land Management
3512	BMP – Best Management Practice CRP – Conservation Reserve Program
3513 3514	CWA – Clean Water Act
3515	ESA – Endangered Species Act
3516	FAA – Federal Aviation Administration
3517	FACA – Federal Advisory Committee Act
3518	FRPP – Farm and Ranchlands Protection Program
3519	DOE – US Department of Energy
3520	DOI – US Department of Interior
3521	GIS – Geographic Information System
3522	GRP – Grasslands Reserve Program
3523	GS ₃ C – Grassland Shrub-Steppe Species Collaborative
3524	MBTA – Migratory Bird Treaty Act
3525	NEPA – National Environmental Protection Act
3526	NWCC – National Wind Coordinating Collaborative
3527	RETI – Renewable Energy Transmission Initiative

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- 3528 RSF Resource Selection Function
- 3529 USDA FSA US Department of Agriculture Farm Services Agency
- 3530 USDA-NRCS US Department of Agriculture Natural Resource Conservation Service
- 3531 USFS US Forest Service
- 3532 USFWS US Fish and Wildlife Service
- 3533 USGS US Geological Survey
- 3534 WRP Wetlands Reserve Program

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3535	Appendix B:
3536	Legal White Paper
3537 3538	From the Legal Subcommittee (presented and adopted at October 21-23, 2008 FAC Meeting)

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3539	Appendix C:
3540	Landscape-Level Mapping Tools
3541	for Assessing Wildlife and Habitat Impacts
3542 3543	From the Landscape/Habitat Subcommittee (presented at October 21-23, 2008 FAC Meeting)

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